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AMBIDEXTERITY

AMBIDEXTERITY

OR

TWO-HANDEDNESS AND TWO-BRAINEDNESS

AN ARGUMENT FOR NATURAL DEVELOPMENT AND RATIONAL EDUCATION

BY

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CONTENTS

PART I.—THEORETICAL

CHAPTER I

Our Hands PAGE 1

CHAPTER II

Symmetry, Asymmetry, and One-sidedness . . . 20

CHAPTER III

Theories of One-handedness 41

CHAPTER IV

Disadvantages of One-handedness 99

CHAPTER V

The Possibility of Ambidexterity 108

CHAPTER VI

The Advantages of Ambidexterity 120

CHAPTER VII

Objections to Ambidexterity 150

CHAPTER VIII

The Philosophy of Simultaneous Movement. . . 170

PART II.—PRACTICAL

CHAPTER I

PAGE

AMBIDEXTERITY CULTURE OR BIMANUAL TRAINING . . 195

CHAPTER II

AMBIDEXTRAL HANDWRITING 206

CHAPTER III

AMBIDEXTRAL DRAWING, ETC. 226

CHAPTER IV

TWO-HANDEDNESS IN HANDICRAFTS AND TRADES . . 235

List of Occupations, Trades, and Sports wherein Ambidexterity is a Distinct Gain or an Essential Factor . . 239

CHAPTER V

AMBIDEXTERITY AND LEGISLATION 243

APPENDIX 247

INDEX 253

AUTHORS AND ARTICLES

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INTRODUCTION

HAVING long been accustomed to write with either hand and to use the two hands interchangeably, I am quite in sympathy with the object of this Treatise.

To train the human body completely and symmetrically, that is, to cultivate all its organs and members to their utmost capacity, in order that its functions may also attain their maximum development, is an obligation that cannot safely be ignored. This completeness and symmetry can only be secured by an equal attention to, and exercise of, both sides of the body—the right and the left; and this two-sided growth can alone be promoted and matured by educating our two hands equally, each in precisely the same way, and exactly to the same extent.

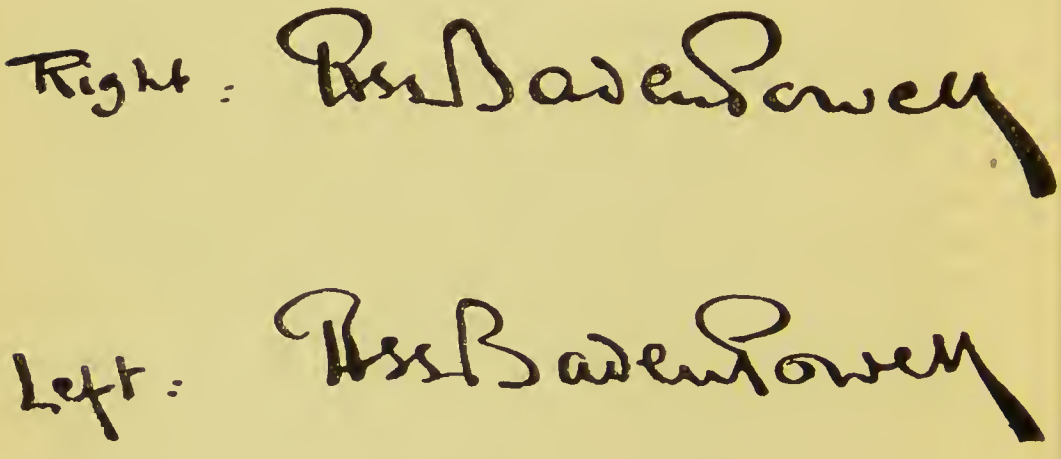
It is hardly possible to lay too much stress upon this bimanual training, or to attach too much importance to the principle, because our hands—and our arms, from which, for purposes both of argument and education, they cannot be separated—not only constitute our chief medium of communication with the outer world, but they are likewise the pre-eminent agency by which we stamp our impress upon it. Moreover, and of equal import to the individual, it is by the movements of these members that the whole muscular tissues on both sides of the body are exercised, strengthened, and perfected.

Passing from general considerations to particular applications, the argument is equally strong and the advantage equally great. There is no doubt that the value of Ambidexterity from a military point of view is immense.

I do not consider a man is a thoroughly trained soldier unless he can mount equally well on either side of his horse, use the sword, pistol, and lance, equally well with both hands, and shoot off the left shoulder as rapidly and accurately as from the right.

The heavy pressure of my office work makes me wish that I had cultivated, in my youth, the useful art of writing on two different subjects at once. I get through a great deal extra—it is true—by using the right and left hand alternately, but I thoroughly appreciate how much more can be done by using them both together.

I wish this Ambidextral campaign every success.



AMBIDEXTERITY

OR

TWO-HANDEDNESS & TWO-BRAINEDNESS

PART I.—THEORETICAL

CHAPTER I

OUR HANDS

AMBIDEXTERITY is not a new discovery: it is as old as man himself. The first man, it will be conceded, was a "bidexter," or "ambidexter," both by conformation and by use, for it is impossible to imagine that he was brought into existence with an instinctive right-handedness already inherent in his being. And since the first pair of truly bimanous creatures revelled in their two-handed dexterity, there have never ceased to be, at all times, but scattered possibly here and there over the face of the earth, worthy representatives of the parent stock; ambidexters of no mean ability—as, for example, the 700 Benjamite slingers—who were able to demonstrate in actual life the great difference between a two-handed and a one-handed individual.

As we know, various philosophers have, ever and anon, referred to the question, and Plato, Aristotle, and others of like fame, have expressed themselves more or less at length concerning it. They evidently recognized and deplored the incongruity and lamentable inconvenience of the lopsidedness that prevailed throughout the community;

and doubtless many of these sages made earnest efforts to advocate and promote the cultivation of Ambidexterity amongst the people; but, so far as we know, those attempts, owing to the apathy, superstition, or opposition which they met with, were as invariably unsuccessful.

One would naturally infer, since all attempts to establish two-handedness have hitherto signally failed, and failed moreover in some cases notwithstanding the most strenuous advocacy of its professed merits and superiority, that the so-called advantages which have been so frequently and enthusiastically expounded must be purely imaginary, and that there really is no virtue whatever in a perfect two-handedness, but that it is far better to have a dexter and a sinistral hand (in other words, a use**ful** and a use**less** hand) rather than two dexter or equally expert and useful hands, similarly adapted for all the ordinary and extraordinary duties of life.

Indeed the argument from general history would seem to be so absolutely final as to render any venture to establish the desirability of a dextral supremacy a most presumptuous act bordering on unpardonable audacity: yet the author is so conscious and convinced of that virtue and of those merits as to challenge the verdict of history, the customs of society, and the deeply rooted prejudices of an overwhelming majority, by proclaiming once more, with no uncertain voice, and in the plainest of terms, the mistake of a one-handed community, the inferiority and disadvantage of a sinistral hand, and the obligation which, in his opinion, rests upon us to discontinue the neglect of the left hand and to substitute a systematic, and wholly impartial, cultivation of the two hands for all the exigencies and demands of every-day life.

How far he is justified in his ambition and convictions the following chapters will perhaps determine. The subject might easily be committed to far abler hands, but he is confident that it could not have a more sincerely enthusiastic advocate.

We are not aware that any book has yet been published in which Ambidexterity is treated generally and exhaustively. Occasional letters to medical and other journals have appeared from time to time during the last forty or fifty years, in which the most varied and often contradictory statements have been put forward; and a few learned monographs—consisting chiefly of contributions read before scientific and other associations—have discussed moot points with more or less completeness; but in the majority of instances the business of the writers has been to elaborate particular or personal views or theories to account for the predominance of the right hand, or for the occasional development of its opposite, left-handedness. In no case has an author started out with the object of treating Ambidexterity as a desideratum to be worked for, and to be secured, so that it shall be established in society as an integral part of our education and being.

The author has availed himself of these articles, from which much valuable information and many important statistics have been derived; he therefore takes this opportunity of gratefully acknowledging his indebtedness to them. Moreover it has been found necessary to review somewhat fully many of the hypotheses formulated by the learned writers referred to, in order to establish or refute their pronouncements, as the argument of this book might demand.

That a practical work on Ambidextral Development and Bimanual Training is urgently required goes without saying; and this volume is intended, be it in ever so humble a degree, to supply that need; its main purpose being, First, to consider the existing state of things, and the relative powers, functions, and duties of the two hands—the right and the left—as at present determined by education and custom. Second, to present in a compact form all the theories that, from time to time, have been suggested to account for the universal one-handedness—really the universal right-handedness—that obtains. Third, to

discuss the possibility and the advisability of cultivating Ambidexterity as an essential factor and element of our National Education: and fourth, to briefly indicate how this consummation may best be brought about.

Ambidexterity is so closely associated and identified with other branches of educational work in which the writer has been engaged for quite a number of years, that it has necessarily become incorporated with them, and has consequently been studied and practised alongside with Handwriting and Drawing,—the two most intellectual and important exercises that can occupy our hands at any time. There need be no apology, therefore, for devoting a separate chapter to each of those subjects.

It is very encouraging, and matter for congratulation, that the twentieth century inaugurates a more favourable environment, and brings with it a much more advanced liberalism, and a spirit of earnest inquiry regarding the proposed innovation; for we have a by no means insignificant minority of intelligent thinkers, both within and without the teaching profession, who are really desirous and determined to bring in the element of Bimanual Instruction, and to make it a fundamental part of our school routine, at any rate with a limited number of ordinary class subjects.

So far as they go, this ambition and resolution are most praiseworthy, but of course the proposed reformation does not go nearly far enough; hence those who take a broader view of the question are devoting all their energies to the propagation of an unlimited and all-pervading scheme of two-handedness that shall not be confined to any specified number of subjects; but a system that shall include all branches and all departments wherever the employment of the two hands (separately or simultaneously) could possibly come in.

Naturally, then, the one grand object of these pages is to encourage and effect this most desirable revolution; for the author firmly believes in the possibility of evolving a

truly two-handed people, that shall be many stages in advance of existing standards both in physical and mental development.

The hand may be said to be, physically, the distinctive characteristic of mankind. It is the chief organ of touch and of gesture language, its expressiveness and teaching power being alike unique. It is the universal symbol of amity, the mystic grasp of the freemason, being older than the builder's art, it is said. It is a weapon equally of defence and offence, and indeed it may be considered the most wonderful piece of animal mechanism—its mobility, sensibility, agility and adaptability are unequalled.

Many writers have sung its praises, to wit Sir Charles Bell :—"The human hand is so beautifully framed, it has so fine a sensibility, that sensibility governs its actions so correctly, every effort of the will is answered so instantly, as if the hand itself were the seat of that will; its actions are so powerful, so free and yet so delicate, as if it possessed the quality of instinct in itself, that there is no thought of its complexity as an instrument or of the relations which make it subservient to the mind; we use it as we draw our breath, unconsciously, and have lost all recollection of the feeble and ill-directed efforts of its exercise by which it has been perfected. Is it not the very perfection of the instrument which makes us insensible to its use?"

Sir Daniel Wilson :—"The human hand, as an instrument of constructive ingenuity and artistic skill, stands wholly apart from all the organs applied to the production of analogous workmanship among the lower animals. Man only, in any strict sense, is a manufacturer."

And Professor Ball :—"Man is the first of the animals —not, as the philosopher of the last century said, because he possesses a hand, but rather that he has a right hand. I consider the preponderance of the right hand not as the cause of the superiority of man, but as the immediate

consequence, as the most eminent sign, of his moral pre-eminence."

We have quoted Professor Ball, although we differ with his finding, agreeing rather with the two previous writers.

A well-shaped hand is a thing of beauty and a joy for ever; and to a wonderful extent it is an index to the character of its possessor. The palmist assures us that even the veil of the future can be partially lifted by a study of the lines on its inner surface. Be this as it may, our hands are a precious possession, and it behoves us to treat them well and to spare no pains in cultivating their powers to the furthermost limit.

Our two hands, then, are and have been for untold generations, distinguished by the terms "right" and "left" or "dexter" and "sinister," according to the side of the body on which they are found. The right hand is the dexter hand in some ninety-seven cases out of every 100 in or amongst English-speaking nations. What we mean by this statement is that there exists a marked and material difference or contrast between the skill, delicacy and sensitiveness as exhibited by the two hands in the adult; one hand, almost always the right, being much superior to the other in all manipulative skill, the left being indeed so awkward —and being generally considered so inferior—as to give even to its name "Sinistral" a signification embracing everything that is undesirable, and a synonym in general for gaucherie. Even at this early stage it must be clearly remembered that this superiority is, in about eighty out of the ninety-seven cases quoted, not a natural phenomenon, but is almost exclusively the result of, what we feel compelled to term, a mistaken and perverted education.

From earliest infancy, when the hands are first put into natural exercise and first used in rational movement, the object of the nurse, of the mother, and of all intimate friends of "the baby," is to suppress every and any indication of an intelligent or free use of the left hand, and

to encourage the sole exclusive and skilful development of the right hand with all its powers.

Now we read in a certain well-known book of a shepherd who, missing one sheep out of a hundred, left the ninety and nine safeguarded and went to find the **one** that was lost. And one would think that if one leg, one ear or one eye of a child were to show signs of diminished vigour, hearing, or sight, the first object of the parent would be to ascertain the root of the "**mischief!**" as he would call it, remove the cause, and thus restore the enfeebled member or organ to its original normal condition, equal in all respects to its fellow. But what do we see with regard to the hands? Nothing less than a deliberate, regularly recognized, and systematic, cold-blooded crippling of the left member from the tenderest age up to the very end of school-life. We are sent into the world with two hands exactly similar in conformation and constitution, and both equally fitted and qualified to perform manual labour of every variety and kind. Yet, because our fathers, grandfathers and great-grandfathers did it, we, princes, peers, peasants and physicians, surgeons, educationalists and teachers, fathers, mothers, sisters and brothers, all combine to crush every bit of elasticity, sensitiveness, mobility, and dexterity out of that "**horrid left hand,**" and to make it what we find it at the present day, viz. an undeveloped, awkward, and almost totally useless limb—to be tolerated as a superfluous appendage rather than cultivated as a priceless treasure! Oh! the pity of it! If any reader think this description rather too strong, let him, if a right-handed man, bind up his right hand for a week (or even three days would suffice to convince him) with the resolve to use his left for everything, and on no account to liberate and use his right. He will nearly succumb to chagrin and mortification before twenty-four hours have expired, and be inclined to anathematize the "System of Education" or the State of Society (or both) that imposes such an insane and unnecessary

infliction as an "untaught" hand upon mankind. Is it not true that, so far as the hands are concerned, the chief feature of civilization is the increasingly pre-eminent use of the right hand; or the special cultivation and development of the dexter hand, whilst the left or sinister hand is relegated to a persistent neglect and a wholly inferior position? Indeed, unless for the purpose of a particular occupation or function, the left hand NEVER RECEIVES ANY EDUCATION AT ALL, but is actually repressed whenever it attempts to assert its equality with the right, and to take its proper share in the daily duties of life.

When denouncing this system of oppression, neglect, and cruelty, we are frequently met with the reply, "Oh! but the right hand is so much more amenable to training and instruction, so much more responsive to influence and pressure"; and one is apt to spontaneously reply, "Naturally so! yes, and inevitably so! how could it possibly be otherwise?" First you subject one hand to say ten years of ignominious obloquy, inactivity, and utter neglect, and then, after bestowing the most refined culture and attention upon the other hand, you exclaim in pious surprise, 'See how much superior this right hand is in every manual accomplishment!!! Observe! how utterly inferior and incapable this left hand is in every necessary occupation!!!'"

Strictly, however, the charge is untrue, for the awkwardness is only such as is met with also in the dexter hand, i.e. during youth time, when any quite novel exercise, movement, or duty is required of it. This statement will be fully proved by an abundance of facts at a later stage in the argument.

It should be noted at this point how such an unnatural treatment of the left hand reacts upon the offenders. Is there a single one of us that has not frequently felt, and does not continually feel, the disadvantage of being so lopsided, so unsymmetrical, so unequally developed, so imperfectly educated in modern times? We admit that

it is highly improbable, if not actually impossible, for a **perfectly** Ambidextrous people—nay, a **perfectly** Ambidextrous person—to ever have an existence; just as it is impossible for a person to have two eyes **exactly** the same in powers of vision, two ears with **precisely** the same acuteness of hearing, and two feet with **precisely** the same powers of walking and standing.

We feel quite convinced that the tendency will ever be to foster a preferential use of the right hand (for a variety of reasons, which will be detailed or indicated in a subsequent chapter), and our contention, as ardent Ambidextral advocates, is not that it should be otherwise.

Of every hundred persons born into the world, some **seventeen** are **strongly right-handed** congenitally (i.e. without restraint of the one hand or any cultivation of the other); nearly **three** will be just as **strongly left-handed**; whilst the remaining **eighty** are **naturally either-handed**, and these eighty, with the proper instruction, would develop both hands equally, and become practically, and to the extent above outlined, perfectly two-handed or Ambidextrous.

Brazilian ladies do now, or did until just recently, mount the horse from the right side and sit on the same side whilst riding, instead of on the left side, as is the custom with most Eastern nations. Our own ladies are much more accustomed to use the left hand than we of the stronger sex are. In piano-playing and in various kinds of house-work, needlework, and personal exercises the left hand is brought into constant requisition, so that a considerable dexterity with the sinistral hand is a sort of natural heritage and possession of womankind in general.

Generally, then, one-handedness is the only existing form of dexterity. This one-handedness is divided, roughly speaking, amongst the race in the proportion of ninety-six or ninety-seven right-handed persons to three or four left-handed persons, the latter being the only individuals, save

in one or two districts above-mentioned, who possess any sensible degree of ambidextral skill for all occupations or work. One of our most distinguished surgeons remarks in a letter under date January 6th, 1903: "In those days of my youth ridicule was resorted to in discouragement of left-handedness—those who were left-handed were looked upon as somewhat 'daft;'" and generally now-a-days the same feeling prevails, for left-handed persons are pitied, sympathized with, and looked down upon as being very unfortunate, nay more, as considerably inferior to their right-handed brethren, who curiously enough pride themselves on the possession of a SINISTRAL HAND that, as compared or contrasted with its DEXTRAL fellow-hand, is incompetent, clumsy, unreliable, and, in every manipulative and mechanical relation or exercise, WHOLLY INEFFICIENT!!!

It is very singular that in so many occupations the left hand is cultivated and used, notwithstanding the widespread and active opposition and aversion to its development. Thus a man will handle the razor quite as skilfully with the left hand as with the right, and this is an operation that demands the most delicate manipulation, if very awkward accidents are to be avoided. Many clean-shaven men known to the writer use the razor in either hand with perfectly equal dexterity and confidence, yet they are not left-handed in the slightest degree as left-handedness is understood; so that this only proves how unconsciously a person may acquire ambidextral aptitude in even the most difficult and exacting functions and employments, without encountering exceptional or insurmountable obstacles, and without being conscious of doing anything at all unusual or remarkable. Similarly most tailors and dressmakers use the scissors with both hands, and with apparently the same ease and skill: engravers in like manner with the graving tool, sculptors and stone-cutters with the chisel, and draughtsmen with the pencil or instrument.

Another surprising phase of the question is that when a billiard-player, a conjurer, a gymnast, a harpist, a juggler, a machinist, an organist, a pianist, or a wood-carver uses his left hand as deftly as his right, the observer seems never to be impressed with the triumph of the left hand over all its cruelly imposed disabilities, so as to ask, "How is it that you have got your left hand to such a marvellous state of perfect skill?" but the exceptional ability is lost sight of in admiration at the general and dual cleverness displayed by the performer. Still more strange is it that the beholder seldom if ever goes on to inquire why the left hand is not trained in a similar manner to perform equally efficiently every duty and function that are allocated to the right.

Is it not a most mysterious and inexplicable fact, that, although people have for centuries been witnesses of the value of the two hands working together with equal dexterity in some few particular vocations, they have never appeared to recognize the much greater, nay, the inestimable, value of a universal two-handedness? We do not wish to trench on the province of a future chapter or to anticipate any subsequent argument in our treatment of this interesting subject, but it does seem one of the most amazing phenomena in history, this undisturbed inertia and passive indifference on the part of the public —more especially the educated public—in connection with such an all-important issue.

It would appear that a larger proportion of persons were capable of using their left hand in preference to their right in the earliest historical periods than exist at the present time, for we find abundant evidence of a widespread use of the left hand not only in the sculptured hieroglyphics of Central America, but also in the Mexican Picture Writings, where the human profiles are frequently turned to the right. In like manner, many of the oldest sketches and drawings on rocks indicate left-handed artists. Indeed it is generally admitted that whilst right-

handedness prevailed amongst the palæolithic flint workers, there existed along with it no small amount of left-handedness. The Rev. H. J. Dukinfield Astley, Litt.D., F.R.Hist.S., writes me that:—"It is very difficult to prove anything as to the Ambidexterity of either Palæolithic or Neolithic man, because both these used stone implements fastened to wooden hafts—spears, arrows, axes, &c. But within recent years evidence has arisen as to the existence of an older race still, to whom the name of 'Eolithic' has been given. Evidence of the existence of this race in Britain has been found by Mr. Harrison in and above Ightham in Kent, on the plateau about 400 to 800 feet above sea level. They are therefore called 'Plateau Implements,' and are pre-Glacial, proving that the Eolithic race inhabited Britain before the Glacial period—some authorities say 80,000 years ago, but in any case many thousands; while Palæolithic man was post-Glacial, and Neolithic man, of the Siberian race, was here till he was overwhelmed by the Goideli-Celtic invasions from 2,000 to 1,500 B.C., and his blood still runs in our veins.

"Now the Eolithic people were, as must naturally be expected, in the very rudest condition of primitive savagery, and their flint instruments were fashioned to be used in the hand; of these there is undoubted evidence that some were adapted for right-hand, some for left-hand use. Mr. Quick, Curator of the Horniman Museum, thus writes:—'Some students believe that these implements are accidental forms of flint, or are found under certain conditions of nature. But when one sees and handles a great number of the specimens, some chipped for the left as well as for the right hand use, I think the natural or accidental theory must fall to the ground.'

"Early man did not consider form of any importance; two objects alone presented themselves to his simple intelligence, a hand-grip and a usable edged tool. He worked with both hands, as we know by the left-handed

forms being almost or quite as numerous as the right." (Journal of the British Archæological Association, vol. lvi. pp. 336 and 340.)

Similarly, the drawings of Europe's Cave-men exhibit the same admixture of right and left handed craftsmen, the right hand, however, always predominating over the left. In the absence of all semblance of education, one might easily deduce such a state of things as the inevitable outcome of a barbarous age; for, without anticipation, we cannot evade recognizing the fact of existing natural preference for the right hand, which seems to have preserved an almost unvarying career from the remotest times up to the present day. As time rolled on, and in fact all through the dark ages of barbarism and incipient civilization, the right-handedness became more pronounced, i.e. the distinction between the two hands became more marked, and all to the advantage of the right member. So far, then, as the evidence of language and history goes, the superiority of the right hand seems to be coeval with the earliest known use of speech.

Coming further down the stream of time, it is found that, particularly amongst the Hebrews and throughout Bible ages, the dextral limb has been singled out for special honour. The Scriptures themselves contain some 100 references to the right hand, and sixty references to the left, the dexter hand being always made the type or symbol of everything noble, praiseworthy, or desirable.

Right and left hands are first mentioned in Genesis xiii. 9. What wonder then, if, with such **apparent** Divine approval and such inspired authority, Right-handedness spread rapidly and became, practically, universal? We say practically, for it must not be forgotten that amongst men of war in the tribe of Benjamin, were 700 left-handed slingers who "could sling stones to a hair's breadth and not miss;" and, also, that amongst the "mighty men, helpers of the war" to King

David, were large numbers who "were armed with bows," and who "could use both the right hand and the left in hurling stones and shooting arrows out of a bow." As the number and variety of Bible quotations on the right hand are of great interest, a selection of the most important is here given, that the reader may the better appreciate the educative power of such a collection :—

Authority.	Sitting on the Right Hand of power (Mark xiv. 62).
Beloved.	Benjamin, the son of the Right Hand (Gen. xxxv. 18).
Dexterity.	Let my Right Hand forget her cunning (Ps. cxxxvii. 5).
Eternity.	The years of the Right Hand of the Most High (Ps. lxxvii. 10).
Friendship.	The Right Hands of fellowship (Gal. ii. 9).
Glory.	Thy Right Hand, O Lord, is become glorious (Exod. xv. 6).
Government.	He had in His Right Hand seven stars (Rev. i. 16).
Guidance.	Led them by the Right Hand of Moses (Isa. lxiii. 12).
Holiness.	Thy Right Hand is full of righteousness (Ps. xlviii. 10).
Instruction.	Thy Right Hand shall teach thee (Ps. xlv. 4).
Justice.	The Lord hath sworn by His Right Hand (Isa. lxii. 8).
Labour.	The vineyard which Thy Right Hand hath planted (Ps. lxxx. 15).
Legislation.	From His Right Hand went a fiery Law for them (Deut. xxxiii. 2).
Longevity.	Length of days is in her Right Hand (Prov. iii. 16).
Omnipotence.	Thy Right Hand hath spread out the heavens (Isa. xlviii. 13).
Pre-eminence.	Sat on the Right Hand of God (Mark xv. 9).
Pleasure.	At Thy Right Hand there are pleasures for evermore (Ps. xvi. 11).
Protection.	At the Right Hand of the poor to save him (Ps. cix. 31).
Reliance.	He is at my Right Hand, I shall not be moved (Ps. xvi. 8).
Salvation.	The Salvation of His Right Hand (Eccl. x. 2).
Strength.	The saving strength of His Right Hand (Ps. xx. 6).
Support.	Thy Right Hand shall hold me (Ps. cxxxix. 10).
Valour.	The Right Hand of the Lord doeth valiantly (Ps. cxviii. 16).
Vengeance.	Thy Right Hand, O Lord, hath dashed in pieces the enemy (Exod. xv. 6).

Victory. His Right Hand hath gotten Him the victory (Ps. xcviii. 1).

Wealth. His Right Hand hath purchased (Ps. lxxviii. 54).

The reader will observe how the right hand is associated with every virtue, every honourable quality, and almost every conceivable good. It is conclusive evidence that in Bible times the right hand was quite as pre-eminent as it is at the present day, and that the left hand was just as inferior and insignificant, although the trend of custom and education has been all along the centuries from then till now to accentuate the cultivation of the one and to repress the development of the "poor unfortunate" other. But, indeed, long before the close of Bible times, the distinction between the two hands had arrived at its maturity, and, so far as preferential use is concerned, we are no further forward than were our forefathers in the first year of the Christian Era.

Certainly we are not in any degree cleverer with the right hand than we were, if we are to judge by their sculpture, architecture, paintings, and illuminations, for in nearly all these departments they are our superiors. It is, however, more than probable that two-handedness prevails to a less extent amongst the various handicrafts, trades, and professions of the present day than it did in those mediæval times of which we are speaking. From the time of Noah until now there has undoubtedly been an uninterrupted preference for, and cultivation of, the dexter hand, but the hand seems really to have lost its cunning in these modern times if the comparison of human productions is to decide the question. Where shall we find a second "Book of Kells" in intricacy and beauty of design? Is this, then, an argument, and if true a very powerful one, for the superiority of Bimanual training? And are we not justified in saying that when the human race were to a greater degree Ambidextrous, they were also more capable of achieving greatness in all branches of Art, Science, and Literature?

Careful investigation into this question might discover unexpected relations and facts that would, if not once and for all decide the controversy, at least go far towards a final settlement of the agitation, and prove quite sufficient to warrant general conclusions of a very weighty character.

There are few subjects about which more nonsense has been talked than that of right-handedness and left-handedness. For centuries it has exercised the minds of not a few curious, observant, and philosophical individuals, but it is during the last hundred years specially that the interest has increased and the literature multiplied so rapidly. Whilst in the scientific and professional departments, more or less learned theses have successively appeared from the pens of earnest and thoughtful writers, containing valuable statistics, experience, or other pertinent information shedding light upon some obscure point or phenomenon; others, who have devoted little time to the study, have advanced all sorts of ex-parte statements and premature conclusions which have collapsed before the feeblest criticism, proving more harmfnl than helpful to the cause they were intended to support or strengthen. One would suppose, to read the indignant protests and deliberate statements of these latter writers, that the right hand was a member endowed with a special anatomical apparatus, with superior articulations, and with a particularly gifted intelligence to control and direct its movements.

Indeed so much has its dominating influence been exaggerated by these exponents that we are led to suppose it has been by far the most powerful factor in .the regeneration and development of the human race, from primeval times to the present day. In fact we are told by the enthusiasts referred to, that no one can really be clever unless he be right-handed; that all the brightest pupils are the most emphatically right-handed; that the greatest intellect and the greatest dextral pre-eminence

are invariably associated together; that the most civilized nations are the most strongly right-handed; and lastly, that it is only in idiots and criminals that there is any reversion to original type in the form of a greater or less development of Ambidextral skill. In brief, the history of **civilization** is merely the history of **right-handedness**.

In another part of this volume the whole question is fully dealt with from the theoretical standpoint; but the assertion or assumption is so sweeping in its character that a more practical reply may here be given in so far as the subject relates to "Cleverest Pupils" and "Brightest Scholars."

Having written to a number of head masters and mistresses of public schools, asking for information regarding their boys and girls, we are enabled to place before our readers some valuable evidence bearing on the discussion. There was little if any difference of opinion. The testimony was practically unanimous.

No. 1. "We have twenty boys, in a school of 680, who are left-handed. I do not find any difference as to intelligence, but the highest boys in the school are right-handed."

No. 2. "I believe all my boys are right-handed; the 'cleverest pupils' certainly are, and so are the stupidest. But I have often noticed that children use the left naturally and are checked. On inquiry I find that one or more boys are Ambidextrous, but not the specially clever ones. Rather the good practical boy with common sense. One of the first boy athletes I knew at school, was so."

No. 3. In this very large school, the head master took special pains in the inquiry, and proposed the following three questions to twelve "boys at the head of the classical side—mostly classical and mathematical scholars":—

"1. Can you write with the left hand? i.e. better than most people can?

"2. Do you do anything (e.g. bat, bowl, or brush your teeth) with the left hand, which most people do with the right?

"3. Have you any reason to think you are **more** right-handed than ordinary people?"

The "captain of school, first mathematical scholar of Caius College, Cambridge, is practically Ambidextrous," but the remaining eleven answered "No" to the third question; all but one (No. 4, a "classical scholar of Trinity College, Cambridge,") answered "No" to the second question; and all but two, the above No. 4 and another, answered "No" to the first.

Five other boys tested by a (D.Sc.) member of the large and distinguished staff in this successful public school proved to be absolutely normal with no pronounced "Dextral Pre-eminence, and gave a negative answer in each case to all three questions; the only reservations being that No. 1 kicks better with his left foot; No. 2 thinks that he can use his left hand rather better than most people can," and No. 4 "uses the left hand more easily than the right when cycling and using one hand to steer."

The information supplied by this courteous head master is very important from the psychological standpoint, and I have to express my warmest thanks to him and others who have furnished these interesting statistics.

A similar correspondence with the medical officers of all our prisons resulted in a concurrence of opinion equally strong, that, excepting where the special training of the criminal produced the sinistral skill, there exists no larger percentage either of left-handed or of bidextrous individuals in that depraved class than obtains in the community at large.

When the great object of both education and custom has been to create an ever-widening distinction between the two hands; when, e.g. our clerks, tradesmen, professional men, and our authors are seen writing with, and almost exclusively employing, the right hand from

year's end to year's end in the most intelligent work, whilst the left hand is resting passively on the desk; when, lastly, a lynx-eyed prejudice is ever on the alert to ridicule or forcibly suppress every attempt in our children to employ the sinistral hand, whether at home or at school, what wonder indeed if the cleverest pupils have proved to be most strongly right-handed, if all our giant intellects did possess a practically useless left hand, and if the most civilized race were, as stated, the most pronouncedly right-handed?

Is not the wonder all on the other side? Is it not amazing that the right hand is not far more pre-eminent than we find it when it is remembered that all the combined forces of society and education have united for generations and ages in thwarting the natural propensities and development of our faculties of two-handedness, and in maturing a one-handed race?

"Nature," happily, has been too strong for them, and the abused left hand, fortunately for us, is not yet atrophied and lost by natural and unnatural selection, but remains vigorous and fit as ever to assert its equal rights and perform its equal functions.

Surely it is time that all this sentimental vapouring about the imaginary advantages of Dextral pre-eminence and left brain predominance should cease; that we should accept the teaching of nature—of anatomy and physiology—of analogy, of common sense, and of expediency; and that henceforth we should afford each hand an equal chance in the race for supremacy—if supremacy there must be—and equal education, and an equal share in all the duties and occupations of life, in order that a perfect Ambidexterity and a symmetrical brain organization shall be secured, both of which should conduce to a better physical development and to a higher standard of general efficiency, in the individual and in the nation at large.

CHAPTER II

SYMMETRY, ASYMMETRY, AND ONE-SIDEDNESS

MAN, in common with the lower animals, appears to be built on what may be called symmetrical or well-balanced lines. If we casually glance at his configuration, it would seem that a vertical mesial line would divide him into two very similar, if not indeed almost identical, halves; his dual organs and limbs, such as ears, eyes, arms, hands, legs, and feet, presenting a remarkable resemblance to each other, whilst the divided halves of his single parts and organs, such as the brow, nose, and mouth, have an equally close likeness to each other. When, however, we look more particularly into the question, it is found that this symmetry is conspicuous by its absence, and that whether we compare the corresponding right and left dual members, or the right and left halves of the single organs, the result is invariably the same, namely, an utter want of geometrical or physical identity or similarity; and we are driven to the startling conclusion, when we extend our inquiries and observations to the animal world, yea, and to plant life also, that it is not Symmetry that characterizes our conformation, but its contrary, Asymmetry. And this irregularity or lack of balance is a striking feature, not only in construction throughout nature, but also in action, movement, and growth.

As the question of Asymmetry has been both intimately associated with, and actually mistaken for, one-sidedness—and hence has been identified with right-handedness and left-handedness in man—it is expedient to

examine the matter more carefully, and to supply a few ascertained facts, that no confusion may remain in the mind of the reader, and that the two things may be clearly differentiated.

It is now generally admitted that beyond this prevailing inequality in the two hands, there likewise exists a corresponding asymmetry in all parts of the body. Thus every microscopist will have a favourite eye; most persons find it easier to wink with one eye than with the other; one nostril is usually more sensitive than the other; mastication is carried on principally on one side of the mouth; we all sleep on one side preferentially; and every mother suckles more at one breast, be it right or left, than the other.

Further, the two ears are not shaped alike, and are not equally acute in hearing power; the two eyes are seldom, if ever, actually the same in acuteness of vision; the arms are of different length and strength—and so are the legs; whilst the two hands vary in the most remarkable manner.

Even the fine lines on the front pads of the fingers vary very frequently. These lines, which are useful in the identification of criminals, have received considerable attention during the last few years from medical men. The results are perplexing, and indefinite, symmetry, asymmetry, and utter irregularity alternating with almost equal persistency and in nearly equal proportion.

Sometimes all the fingers of both hands will correspond, generally most of them match, but very often, perhaps in the great majority of cases, one finger will show an entirely different type from its fellow of the other hand. Such departures from the rule of symmetry are, up to the present, quite incomprehensible, but their occurrence in structures ready formed at birth, and not subject to modification by growth or use, is an important fact.

Dr. T. Dwight continues:—"Again, with regard to the head, it is seldom held evenly. The joints are so made

that it is unnatural for us to hold it straight. It rests much more comfortably and securely when turned to one side. It is needless to say that an inclination to one particular side becomes habitual, and very curious changes in the head and face result, some of which are to be seen even in the bones. . . . The unevenness of the two sides of the head is prettily shown on the outlines found at hatters' shops. . . . The want of perfect symmetry in the face is a twice told tale. The ways of the nose are notoriously irregular, pages could be written on its deviations from the straight path. The right side of the upper jaw is the stronger. Its teeth are arranged in a smaller curve. The right cheek is usually the fuller. . . . This want of symmetry in the face, and particularly in the eyes, naturally suggests the question as to how far the position and slight distortion of the face may be the result of the habitually greater use of one eye, and whether its effects may not extend to modifying the position of the body, and causing the more ready use of one hand. That there is some truth in the suggestion is very probable, but the question is a very difficult one, which still requires much research."

In short, whatever may be the original cause, every tendency, every development, and every habit of the human body is towards asymmetry, and NOT in the direction of exact symmetrical balance, or bilateral equality.

When these observations and investigations are carried beneath the surface, and extended to the bony skeleton, similar irregularities are constantly met with. I believe it to be a fact that hitherto no such thing as a perfectly symmetrical skeleton has ever yet been found; that is one in which the bones of the two sides correspond exactly in shape, length, and weight.

The very frequent discrepancies and the considerable divergencies that are constantly encountered, are both interesting and inexplicable, not merely to the ordinary

mind, but equally to the scientific student and to the most distinguished anatomist.

Mr. J. G. Garson says that, after carefully examining and measuring in the most scientific way possible the bones of seventy well-authenticated skeletons, in seven only were the legs of equal length; in twenty-five the right leg was the longer, and in the remaining thirty-eight the left leg was longer; and not only was the left leg longer, but the difference was greater than when the right leg exceeded the left.

These "inequalities in the length of the limbs do not, as far as my observations go, seem to be confined to any age, sex, or race, as I find that the limbs of young persons differed quite as much as those of many adults. There was the same variety in the limbs of females as males, and of Australians or Negroes as Europeans."

In fifty of the above seventy skeletons, when the arms were measured, a similar or perhaps more pronounced difference was discovered. In thirty-six of them (or 72 per cent.) the right arm was longer than the left; in twelve the left arm was the longer; and in only two (or 4 per cent.) were the two arms equal.

On comparing both arms and legs of these fifty skeletons, the right arm and left leg were longer than the left arm and right leg in twenty-three cases; the contrary obtained in six cases; the right arm and right leg were longer than the left arm and left leg in thirteen cases; and the left arm and left leg were the longer in four cases. In the remaining four skeletons the legs were equal, but the right arm was longer than the left in two of them, and in the other two the arms were equal.

In only two skeletons out of fifty, then, was there found to exist equality in length of limb—just 4 per cent. Unfortunately we are not told whether these two symmetrical skeletons were of adults or children, because it would be interesting to know if the skeleton of an adult

had actually preserved its equal lengths of limbs in spite of the adverse influences of education and practice.

The measurements by other observers are of a like kind. Dr. Dwight found that in forty-four persons, the right arm was longer than the left in thirty-four, the left arm the longer in seven, and that both arms were equal in the remaining three.

Dr. Rollet, of Lyons, found ninety-six, out of 100, with a longer right arm, three with a longer left, and only one with both equally long.

Dr. Hitchcock, of Amherst, measured the arms of 1,759 students, amongst whom the greater proportion had a longer right arm (the figures are not given). The above measurements work out at just 3 per cent. being possessed of equally long arms.

Besides, it is not only in length, but in strength also that these limbs differ; and the right arm is in the large majority of instances found to be the stronger, whilst the left leg is frequently much stronger than the right; Mr. W. J. Simpson of Edinburgh being of opinion that though the right leg is generally the more skilful, the left leg is **quite as often** the stronger.

In 312 students examined by Dr. Hitchcock, 78·25 per cent. had a stronger right arm; 13·7 per cent. a stronger left, and some eight per cent. had equally strong arms; whilst with forty left-handed students, twenty-one had a stronger left arm, seven a stronger right, and no less than twelve were equally strong in both. Nature and education combined, of course, fully account for this unusual percentage of equality.

It may therefore be taken for granted that with regard to both upper and lower limbs asymmetry is the rule and symmetry the rare exception; and furthermore that the same irregularity or asymmetry prevails almost invariably throughout man's whole skeleton. The pursuit of this phenomenon into plant and animal life is most instructive —we can only briefly refer to it. It may be observed in

the claws of a lobster or crab, and in the teeth of a narwhal. This cetacean generally exhibits a long left tooth and an undeveloped right one, but sometimes this order is reversed, and still more rarely both teeth are met with fairly developed. In flat fish the position of the eyes varies wonderfully, and at times one of these fish will be seen swimming on the wrong side.

Before dismissing this question of asymmetry in animals, we must discuss the theory set up by certain writers that this irregularity actually develops into one-sidedness, and, with such creatures as monkeys, into right-sidedness.

Dr. W. Ogle, a most painstaking and able inquirer, has bestowed much attention on this subject, and he remarks that "the observations which I made on monkeys have convinced me that they, like us, are as a general rule right-handed. I spent much time in investigating this matter at the Zoological Gardens, and I found that of twenty-three monkeys, twenty were right-handed and three left-handed. The parrot supports itself on its right leg whilst using its left foot to hold the nut; this in a majority of cases; and each individual parrot always acts in the same way. Of eighty-six parrots that I tested repeatedly in this way, sixty-three invariably supported themselves on the right leg, while the remaining twenty-three as invariably perched on the left one."

One would naturally infer from these facts *re* the parrots, that they are left-footed, since they use the left for the dextrous exercises, and use their right foot for gripping the perch because it would appear to be the stronger, but Dr. Ogle takes the opposite view, for he says:—"It may perhaps be objected that, as the parrot, though it perches on the right foot, uses the left to feed itself, it may as fairly be said to manifest a sinistral as a dextral pre-eminence. . . . But, as a matter of fact, the pre-eminence must be considered dextral, not sinistral, for in the double act that part is fundamental which

precedes the other. The parrot must rest itself upon the right leg **before** it proceeds to use the disengaged leg; and, also, the young parrot **must first learn** to support itself on the right before it can learn the after act of feeding itself with the free foot. In other words, the original selection is of the foot which shall serve as a support, not of the foot which shall be used for feeding—and this selection is in favour of the right as a rule.

"Repeated observations of birds of various orders, other than the parrots, have led me to believe that not only is the left leg used as much as the right for perching, but that the very same individual uses sometimes one, sometimes the other, indifferently. Parrots are, in fact, the only birds in which I have been able to detect with actual certainty any pre-eminence in one side above the other."

In this very plausible reasoning of Dr. Ogle's we think there are two or three mistakes, one of which is the assertion that the young parrots have first of all to **learn** to support themselves on one leg. Is this a fact, or do birds instinctively perch on one leg from the very first in the same way that young ducks swim at the very first plunge and quite as well as their mothers? I have never seen chickens **trying** to stand on one leg any more than **trying** to walk on two, nor have I ever seen a duck or a goose or a duckling or a gosling **trying** to swim with one foot, although I have frequently observed them, and more especially swans, use one, and either foot, singly, according as they wanted to go in the right or left direction.

Our contention, therefore, is that the young parrot neither **learns** to support itself on one leg nor **learns** to feed itself with the other, but that from the first, with this bird, both actions are instinctive or automatic, and that any selection it may make of the right or left leg and foot for purposes of perching or feeding is determined entirely and exclusively by the circumstances or the occasion.

However, on the other hand, assuming that Dr. Ogle is right in saying that young parrots have to learn how to perch on one leg, we still must protest against his conclusion, for we may just as well declare that the prior selection of the left hand for steadying the book (or of the steadying hand) is argument sufficient against the subsequent selection of the dextrous hand for managing the pen (or of the writing hand), since the hand has undoubtedly learnt to hold things steady ages before the dextrous hand had learnt to write. Or, again, it is just as rational to say that every artist is left-handed who holds the palette in his left hand and uses the brush with his right, and for the same reason, according to Dr. Ogle's logic.

Certainly, if the fact that because monkeys used their right hands to extend towards, grasp, and manage nuts whilst steadying, supporting or suspending themselves with their left (as Dr. Ogle says they did), they are to be considered right-handed (as Dr. Ogle says they are), then, So, because parrots use their left feet to extend towards, grasp, and manage the nuts whilst supporting themselves on their right (as Dr. Ogle again says they do), we must consider them to be left-footed—and this by an unavoidable parity of reasoning.

Still once more, it is not Dr. Ogle's logic merely that is challenged here—so are his facts; for what does Dr. Hollis say in his contribution to "The Journal of Anatomy," entitled "Lopsided Generations"?—"I have tried experiments with specimens of the Rhesus Monkey, the Bonnet Monkey (Macacus Radiatus), the Macacus Silenus and the Macacus Cynomologus, and I have been unable to detect, as the result of several experiments in each case, any preference for the use of the right limb." The well-known Dr. Humphrey, who is more fully referred to in a later chapter, expressly declares that "in none of the lower animals is there that difference between the two limbs which is so general among men."

On reading these conflicting statements by such careful observers, I was much exercised in my mind, and was also utterly unable to account for such a flat contradiction as to the presence or absence of this preferential use of one side; I consequently resolved to make some observations on those and other animals myself, with a view to ascertaining whether Dr. Ogle and those who agree with him, or Drs. Hollis and Humphrey, who deduce the very opposite conclusions, were right. To this end I visited the *Zoological* Gardens, and spent considerable time there in watching the natural gambols and movements of the monkeys; the actions of the parrots under ordinary and other circumstances, and also the habits of the birds—including the waterfowl—in their several inclosures.

From first to last the monkeys exhibited the most perfect two-handedness, not one single act did I notice that would point to any preference whatever towards either one of their four hands. Whether leaping and flying all over their cages in swift pursuit or flight, or engaged in other less energetic exercises, whether their bodies were in motion or at rest, both hands were used indifferently, and strictly interchangeably, for everything. This view is supported moreover by the testimony of that acute observer, Professor D. J. Cunningham, who assured his audience, at the Huxley Lecture on October 21st, 1902, that:—"For many years I have had an intimate experience of both the higher and lower apes in the gardens of the Royal *Zoological* Society of Ireland, and have never been able to satisfy myself that they show any decided preference for the use of one arm more than the other. I may mention that recently a male chimpanzee, about six years old, having died in the gardens, I had the bones of the two upper limbs carefully prepared. They were then weighed, and it was found that the bones of the two sides were as nearly as possible equal in weight; what slight difference there was, was

in favour of the left upper limb." (Journal of the Anthropological Institute, p. 285 and note.) "I cannot persuade myself that the ape possesses any superior power in either arm." (Ibid. p. 293.)

Dr. Ogle's observations having been made in or before 1871, we may conclude that few, if any, of the monkeys viewed by him have survived that long period of thirty odd years, but even this hardly explains such a total absence of one-handed preference. The parrots also which I repeatedly tested in cages and on stands exhibited the same supreme indifference to one-sided culture. They managed the nuts equally well with both feet (the same parrot for instance at different times). Inquiries addressed to the attendants, as to which, if either, foot was generally used, elicited the reply that there was never any difference at all; that the parrots ate, or held their food, perched, and climbed similarly with both feet; but that if there was any preferential use, they thought the left leg and foot had it, which hypothetical preference was of course fully explained by the restrictions of their confinement, or the chains on their legs.

With reference to horses standing at ease, cows, pigs, deer, and other animals lying on one side, my constant and close observations have utterly failed to discover any appreciable favour bestowed on either the right or left side. In counting the horses standing easy on the right or left leg, the numbers (out of hundreds of standing horses not resting on either leg) varied all the way up to thirty easing the left to thirty-three easing the right. Sheep, goats, pigs, deer and other animals, including dogs, appear to utterly disregard the question of "Which side" save as peculiar circumstances or local placement may decide; the birds perching on the left leg, others and about as many on the right, and changing their leg (as indeed the horses did also in easy standing) at shorter or longer intervals.

When the lions are fed, they—in common with the

tigers, jaguars, leopards, &c.,—hold the meat similarly with both paws, and in climbing they showed no preference for either side, whether in ascending or descending. Even the bears sitting on their haunches observed the same neutrality; and if they did entertain any secret liking for either paw or for either side, they decidedly refrained from displaying it on those occasions.

It will be noticed too that birds, in sleeping, hide their heads sometimes under one wing and sometimes under the other.

Sir John Struthers, M.D., in the "Edinburgh Medical Journal," writes:—"My shoemaker informs me that the right side of the hide is generally thicker than the left; and on further inquiry at a leather merchant, who deals largely in the hides of the calf and ox, I am informed that the above is a well-known fact in the trade, the right being known as the 'lying' side of the skin. The quadruped would appear at any rate to lie more on the right than on the left side. It would seem as if this must be during sleep, for one may count the ruminants, with their paunchful of grass, resting about as numerously on the left as on the right side; but the direction of the wind and sun, and the slope of the ground, with the direction in which the animal was standing, may influence this, and there should be a tendency to alternate the sides for muscular relief."

Accepting these statements of Sir John Struthers as correct, the cause of one-sidedness in animals would be materially strengthened; but we think even a cursory glance at the argument would reveal its weakness, and the extreme improbability of its conclusions. For is it not natural to suppose that at any rate in the case of calves there could not be any such difference in the two sides, inasmuch as there had been no time for any amount of lying to affect the skin? If the calf had spent the whole of its short life lying on its right side, the skin could not

show the smallest change arising therefrom. And similarly with the ox, which, as we shall presently hear, is usually killed when quite young. If the learned doctor had only taken cows to illustrate his theory, there might have been a possibility of escape; but with calves and oxen the argument stultifies itself. The presence of such phrases as "**would appear** at any rate," "It **would seem as if**," "**may influence** this" and "there **should be** a tendency," goes to show that Sir John has very little confidence in his own logic, or in the assumed facts on which that logic is based.

The two questions, then, that we have to consider and determine are, first, is the right side of the skins or hides of oxen and cows and calves thicker than the left? and, second, is this thickness caused by the animals lying much more on the right side than on the left?

In order to test the first of these questions, a series of observations was begun with reference to calves, cows and oxen, and a scheme of inquiry was also instituted, both of which should be at once as comprehensive as they were conclusive. This subject of one-sidedness, and of the right-lying side of animals, has possessed a kind of fascination for the present writer; and no part of the entire argument has afforded more genuine pleasure than the study of the asymmetry, and the assumed right-sidedness, of certain animals, domestic and other. The perplexing fact, that two equally competent, careful and distinguished authorities should—after similarly prolonged scientific and professional experiments and observations—flatly contradict each other in their deductions and pronouncements, was too remarkable a phenomenon to pass over in silence; hence the determination to sift the question of one-sidedness (both in handling and in lying) to the very bottom, and to ascertain what were the actual habits of the animals thus so very diversely criticized.

The saving clause in the doctor's case is evidently that which locates the right-lying to the night-time, and where he says, "It would seem as if this must be during sleep;" but there is no obligation on the part of his critics to answer a mere unproved assumption, even were there any ground for supposing it to have ever so small a support from actual fact or common experience, which this particular supposition most certainly does not possess; for what reason is there to imagine that calves, cows, or oxen will have two specified and unvarying modes of reclining, which they will strictly observe without confusion every day and every night? We shall therefore understand, and take for granted, that this **right-lying** is to be decided once for all by the ordinary habits of the animals during the day as determined by careful observation, and by the evidence of a large number of leather merchants, tanners, importers, and specialists (including curriers, of course).

We feel strongly with regard to this question, because once decide and dispose of the delusion, or mistake, which attributes one-sidedness to animals, and a very great difficulty has been got rid of in the argument which will be hereinafter set forth as to right-handedness in man. Not that the argument referred to would be invalidated even by the demonstrated right-lying tendency of animals, but if the total absence of all bias and one-sidedness in the brute creation can be satisfactorily proved, the reasoning from analogy will be of significant value when we treat of the cause of so much one-handedness in man.

On general lines it may be objected to this assumed one-sidedness of these cattle, why should such a bias be confined to three or four kinds, and why should not the preferential use of one side or the other extend to every species of animals on the face of the earth? There could be but one reply to this question in any case. And that

reply is, because these animals, so affected, have been for thousands of years subject to man, and, by the restraints of domesticity and confinement, their natural habits have been modified to the extent of a hybrid one-sidedness, which, in the best cases, is both uncertain and fugitive in its character.

The results of a continuous and prolonged series of test cases, with widely varying numbers of cows and oxen, are of a most decisive character. From three to nearly 300 animals have been the objects of observation at one time; but in no instance have more than forty-three been counted lying down at the same instant.

In one case a certain field of from fifteen to fifty cattle (the numbers varied every five or six days) was seen daily, often twice a day, at irregular hours, for several months together. The numbers were taken down carefully, and the figures are so strong as to almost prove too much. However, whilst there is this approximate unanimity, it may be well to state that no case of identical or similar results, on the one hand, or of predominant right-lying, on the other, has been suppressed.

Herewith are given forty comparisons, it being understood that the animals were lying down at the same time and in the same enclosure. Except in one case the beasts were always in the open field; no strong winds were blowing to bias their action; when the sun was shining powerfully the animals were to be seen lying on either side, quite indifferent to the fact; and, so far as could be ascertained, they were never influenced by any external modifying force whatsoever. No care was taken to determine, in those groups that were seen on so many occasions, whether the same cows always reclined on the same side, or on either side indifferently; but it is certain that they must have used both sides with about the same degree of frequency, because the numbers varied so very widely and constantly.

Left.	Right.	Left.	Right.	Left.	Right.	Left.	Right.
0	1	2	1	4	3	7	6
0	1	2	1	4	2	9	9
0	2	2	2	4	2	9	3
1	0	2	5	4	0	9	2
1	0	3	3	5	10	10	2
1	1	3	3	5	5	11	9
1	1	3	2	5	3	11	2
1	2	3	0	5	2	12	9
2	0	4	5	6	9	13	5
2	1	4	4	6	3	23	20

In the above forty observations the total numbers read, 199 lying on the left side, and 141 lying on the right. This gives about 41½ per cent. only in support of the theory, and 58½ per cent. in opposition to it. It seems strange that after more than 1,000 cattle have been seen, out of which nearly 350 were lying down in the manner described, that the right side should be affected in the way mentioned by the doctor, and by the shoemaker and tanners he communicated with.

Since the above was written the author has taken an additional series of observations whilst travelling some 250 miles through the Midlands of England. The results were as follow :—

0 left, 1 right occurred fourteen times.
0 left, 2 right occurred seven times.
0 left, 3 right occurred twice.
1 left, 0 right occurred twenty-one times.
1 left, 1 right occurred twenty-one times.
1 left, 2 right occurred eleven times.
1 left, 3 right occurred four times.
2 left, 0 right occurred eleven times.
2 left, 1 right occurred eighteen times.
2 left, 2 right occurred three times.
2 left, 3 right occurred once.
3 left, 0 right occurred three times.
3 left, 1 right occurred nine times.
3 left, 2 right occurred three times.

3 left, 3 right occurred five times.
4 left, 0 right occurred four times.
4 left, 1 right occurred five times.
4 left, 2 right occurred twice.
4 left, 3 right occurred twice.
4 left, 4 right occurred twice.
5 left, 2 right occurred three times.
5 left, 3 right occurred once.
6 left, 2 right occurred twice.
7 left, 3 right occurred twice.
12 left, 4 right occurred once.

These 157 separate observations, all taken on the same day practically, give a total of 301 animals lying on their left sides, and only 192 lying on their right; working out at 61 per cent. left side, and 39 per cent. right side, in round numbers.

As all these animals, save about a dozen, were found in varieties of surroundings, in sunshine and shade, on flat ground and on sloping ground, and at all times of the day from 10 a.m. to 7 p.m., their positions are the more significant, and they seem to go very far in supporting, yea proving, the contention that the right side is NOT the lying side of such cattle any more than the left.

The author took the opportunity to observe the reclining attitudes of sheep at the same time, although no figures were recorded. But it was obvious that their positions were quite as varied as those of the cows, oxen, and horses; and though, during the journey, many hundreds of sheep were seen lying down, in no case was there any uniformity of either side, whether in large or small numbers. This also agrees with the habits of the larger animals.

Notwithstanding the conclusive character of these figures, inquiries were made amongst farmers, curriers, and tanners. The replies varied but very little, the general tenor being that this one-sidedness in the animals referred to did not exist. One large firm of tanners writes:—"We don't know that there is any material difference in

substance of the two sides of a hide, and we have tanned most kinds."

Another very well-known and long-established house treats the matter still more particularly, and states:—"Replying *re* ox and cow hides, in one branch of our trade it is necessary to split the tanned hide down the backbone, and to accurately cut from patterns, worked from the backbone, leather into various shapes that must match each other from the same part of each side. WE HAVE NEVER NOTICED ANY DIFFERENCE WHATEVER, AS —providing the workman is careful—THE TWO SECTIONS, ONE FROM EACH SIDE, WILL ALWAYS BE A MATCH FOR GROWTH, TEXTURE, AND SUBSTANCE." (The capitals are ours.)

A third authority says:—"There is no difference in the sides of cattle up to four years of age. No difference is noticed in the case of oxen which are usually killed young; but in the case of old cows, the belly on the left side is more baggy and loose than that on the right side," and in a subsequent letter this gentleman observes:—"I presume the extra looseness is caused by the animals lying on that side, but the matter has not been investigated as far as I know, as it is not of much interest to tanners"!

Once more, and the reply runs as follows:—"Our experience is that the left side of hides, cows especially, is much more difficult to work than the right. In dressing the hides our curriers have to work them out flat upon a large table. This is done when the leather is quite wet, in order to get the goods flat, and to get all the grain out. The left side is harder to get flat and to work generally."

The present writer called on the firm from whose letter the last quotation is taken, when, in a most interesting conversation, they confirmed the fact, and their foreman currier —through whose hands some 600,000 hides have passed —said that this was their common experience. Adjourning to the store-rooms, several hides, taken at random from different bundles, were examined, with the result

that in every one looked at there was the same bulginess, or lack of uniform flatness, on the left side. What caused this irregularity they could not say, nor even suggest, so the inquiry was carried a further step forward, by reference to several importers of foreign hides, and to specialists in the tanning and curriers' trade.

Up to this point, then, the evidence of extended observations shows that cows and oxen lie, to a slight extent, preferentially on their left sides, and certainly not on the right as stated; whilst the experience of tanners and curriers is that, whatever the cause may be, the left side of the hide is never so flat or so easy to work as the right side, but that it is loose, baggy, and difficult to dress as compared with the right side.

Herewith are presented the opinions and experience of the second set of authorities to whom inquiries were addressed.

No. 1 writes:—"As a practical tanner I am not aware of any constant difference between the two sides of the skin, of the sort you mention."

No. 2 says:—"In cow hides we have noticed a baggy side which is in some slight degree more loose and flabby than the other; but not sufficiently so to affect the texture of the hide when tanned, or, to a perceptible degree, the substance. Our idea is that the slight bagginess is caused by the presence of wind in the stomach, which is forced on the opposite side to which the animal is lying."

No. 3 writes:—"We cannot say that we have ever noticed an extra bagginess on one side of a hide more than another, although we have often heard of it. We may say that we tan nothing except heifer and ox hides." The experience of this firm is quite in accordance with the statement that those animals are killed whilst young.

No. 4 concludes a long and most interesting letter as follows:—"Finally, in regard to the preferential use of

one side by the cows or sheep, I have never noticed with grazing cattle or sheep that they have a preferential side, and I doubt whether the looseness or bagginess of the hide or skin can be directly attributed to the lying down, because all animals lie more on the stomach than the side." The writer of this very valuable decision has made a profound study of the question of breeds and hides, and in a long letter, in which he refers to stall-fed cattle, ship-borne cattle, and wild or prairie cattle, he explains most lucidly many curious relevant matters regarding them.

No. 5 replies:—"We frequently notice that one side of the hide differs in character from the other, but we should not go so far as to say that it is the left side which is always the loose and baggy one. This is merely a surmise on our part, and may be quite wide of the mark; it is a theory which we hold, probably for want of a better, but there seems a fair amount of reason in it."

No. 6 is precise and conclusive:—"With regard to ox hides from the River Plate, I have only very occasionally noticed in some hides a slight difference, which would probably be accounted for by the fleshing process in the tannery; but there is no certain invariable rule, unless it be that both sides are alike."

The result of all these inquiries, then, is to show that there is no such thing as a uniform or general thickening of one side of the skins or hides of the animals named; and with regard to the looseness or bagginess, which is a common occurrence in the hides of cows, some of the tanners say it is found on the lying side, whilst others say just as positively that it is found on the upper or non-lying side. In any case, we are justified in concluding that there is no support to be obtained to the theory of animal one-sidedness as set out by the doctor and his followers; that one-sidedness is not a characteristic amongst the brute creation, and is not recognized or

displayed in natural life; that the universal law pervading and governing all locomotion and action is absolutely untainted with any bias towards either the right or left side in all well-known animals; and, further, that if any such peculiarity as a preferential use of one side is ever exhibited by an individual member of a species, it is merely a freak of nature (of not the least account in the argument now under consideration), or the unavoidable effect of a peculiar environment; and that in every such case it has nothing to do with the prevalent existence of asymmetry in animal organization and conformation.

Asymmetry and one-sidedness, then, are seen to be totally different things, neither of which appears to influence the other to any appreciable extent. For example, the most symmetrically organized and constructed person may be very strongly right-handed, whilst another, similarly symmetrically formed, may be just as strongly left-handed; yet once more, one man shall have his right arm longer and stronger than his left, his left eye shall see better than his right, his right ear shall hear better than his left, the corresponding finger-prints on each hand shall differ in shape, the fingers themselves shall also differ in both length and thickness, his left leg shall be longer and stronger than his right, and yet with all this wonderful asymmetry, he shall not be either left or right handed; i.e. he shall not have any natural bias towards one hand or the other.

Before leaving this subject of asymmetry, a passing reference may be fittingly made to that most mysterious phenomenon occasionally met with by medical men which has hitherto baffled all attempts at explanation, viz. "Transposition of the Viscera," and to the fact that such a wonderful reversal of all that is natural does not seem to affect the health of the individual in the smallest degree. Those who are so constructed remain quite normal in their functions, habits, and movements. More

particular mention of this peculiarity will be found in a subsequent chapter.

It has, then, been clearly established that the theory of one-handedness in man can derive no support whatever from a reference to the assumed one-sidedness in animal life, for such one-sidedness does not exist in any species with which we are at present acquainted.

CHAPTER III

THEORIES OF ONE-HANDEDNESS

ONE-HANDEDNESS is so common all over the world, and has been so in every age and nation back to the remotest historic period, that the conclusion is forced upon us that there must be a very cogent reason for such a manifestation. Doubtless there have been all along the past centuries of civilization periodical waves of curiosity or inquiry as to the prevalence of one-handedness; for observant minds must have been struck with the anomalous state of things, and the superior dexterity of their right hands. But in spite of the most careful study, we are almost as much in the dark regarding the true cause of dextrality, and of the much less frequent sinistrality, as were our forefathers thousands of years ago.

Elaborate and plausible theories have been formulated to account for the one-handedness of man, but, as we shall see in the sequel, there is nothing hitherto advanced that can be accepted as the prime cause of it. Wonderful, as all will grant it is, that a two-handed creature should be one-handed in practice, it is still more wonderful that, go where we will, men are not merely ONE-handed, they are all of them RIGHT-handed! If there had been as many left-handed persons as right-handed, or thereabouts, the problem would be a different one, and we might feel inclined to challenge the perfection of an economy that produced a two-handed order of beings who were unable to utilize the limbs with which they

were provided, finding that it was much better to possess one dexterous hand than two.

But when it is further seen that practically every nation elects to use only one hand, and that they are all equally peculiar in selecting the same hand, namely, the Right, for the post of honour, the complexity increases, and we are forced to the inquiry, Why is man given two hands of exactly identical capabilities when he can, or does, fully use only one? and why was not the left member a kind of dummy hand, with just enough organization and prehensile power to make it what man religiously resolves it shall be, a poor, feeble, and very inferior understudy to the right?

Why invest the left hand with LATENT potencies of sensibility, mobility, and agility, equal in every respect to the ACTIVE, because cultivated, potencies of the right hand, if in ninety-seven cases out of every hundred they are to lie dormant and useless for the whole period of a man's life? Is there not some oversight, superfluity, or mistake in such a fact? Nevertheless, for the past fifty years philosophers and scientific men have not been exercising their faculties in trying to remedy a serious fault; on the contrary, they have been positively declaring the wisdom of a ONE-handed principle, and of a one-handed race; more, they have sagely, and occasionally very bitterly, denounced the advocates of a TWO-handed innovation as cranks of the most pronounced type.

No pains have been spared in the propagation of this one-handed education. Parents, teachers, doctors, and nurses on one side have combined to crush every natural aspiration and effort in the unfortunate left hand; and on the other side, prejudice, ignorance, and custom have united their forces to make this differentiation still more defined and absolute.

It is now our duty to present, in as compressed a form as possible, with a due regard to lucidity, the several

hypotheses that have been put forward to account for the right-handedness that prevails; to make upon them what comments may seem desirable or necessary, and to offer as a substitute for them all, what would appear to be the most and only simple, natural, and satisfactory explanation of the whole question that we think can be proposed.

The theorists whose speculations it is intended to examine may be conveniently arranged into two classes, according as to whether they ascribe right-handedness to causes within or without the individual, and the questions they have set themselves to decide (and which they have to their own entire satisfaction conclusively answered) may be framed as follows:—

First: Whence does right-handedness arise, and is this dextral superiority innate and congenital, that is, are there organic or constitutional reasons for its general pre-eminence?

Second: Is right-handedness the result of acquired habits consequent on the recognized convenience of uniformity of action amongst members of the same community?

Third: Is right-handedness, however acquired, transmitted by heredity, and, if so, to what extent?

Those authorities who contend that one-handedness is an acquired habit, the result of external pressure or influence, as nursing, education, &c., will comprise the first class; the second class including those who maintain that one-handedness is a natural faculty or an instinct, or that it is the result of some organic peculiarity or development of the human body.

It is asserted, then, that RIGHT-HANDEDNESS is

1. The result of Nursing and Infantile Treatment.
2. The result of Practice in Writing and Drawing.
3. An acquired Habit.
4. The outcome of Warfare, Education and Heredity.
5. The result of Hereditary Impulse.
6. The result of a Mechanical Law.

7. The result of Internal Organic Structure.
8. An Instinct or Endowment.
9. The effect of Visceral Distribution.
10. The result of Bloodvessel Arrangement.
11. The result of Brain One-sidedness.
12. The result of Natural Selection.

Although some of these theories are rather indefinite and others overlap to some extent, it will be convenient to discuss each one separately on its own merits, and this we purpose doing even at the risk of a little repetition.

1. The Result of Nursing and Infantile Treatment.

This suggested cause of right-handedness may be dismissed with but scant consideration, for on reflection it can hardly be looked upon as a really serious statement. That it has been put forward in all honesty (though we have failed to trace its modern authorship) there is no doubt, for Dr. J. Mark Baldwin observes, "It has frequently been held that a child's right-handedness arises from the nurse's or mother's constant method of carrying it: the child's hand which is left free being more exercised, and so becoming stronger." This theory is ambiguous as regards both mother and child. The mother, if right-handed, would carry the child on the left arm in order to work with the right hand and arm. But this would leave the child's left arm free, and a right-handed mother would thus have, or be found with, a left-handed child, and *vice versa*. Common experience proves that neither of these positions is true.

Again, we are told that infants get right-handed by being placed too much on one side for sleep. Such an argument is too obviously absurd for reply at any length to be made, for it is impossible to conceive that such a uniform result should ensue from manifold, diversified, and even contrary modes of nursing. Plato, however, ridicules the idea that the use of the right hand is natural,

and attributes the weakness of the left side to bad habits established by nurses and mothers. This theory, therefore, has all the advantage that antiquity and classical association can confer upon it.

Nevertheless, it cannot be denied that the environment of infancy exerts no small or insignificant influence upon the child as to its future manipulatory development, for the period is one in which the impressionableness is at its maximum in the individual's being. Mr. W. H. Borham, in a letter to "The Lancet" some time ago, contributed a most interesting case having features bearing very directly on the point under review, and on the kindred question of fugitive or sporadic left-handedness. He says:—"Out of a large family of some generations I never remember one having been left-handed. My second son, however, soon after his birth, was obliged to be brought up by a wet-nurse who was left-handed; and she continued to be his nurse until he was five years old. During that time he was left-handed in everything he did. After the attendance of the nurse was no longer required the boy gradually forsook his left-handed ways and has been right-handed ever since. . . . The inference I draw is this:—The child's impulse from example and its practical nature may be the means of carefully constructing a left-handed theory upon a firmer basis!"

It is dangerous, useless, and illogical to argue from a solitary case and to deduce therefrom general conclusions, but in this instance the facts undoubtedly show what can be done, nay what is being done every day to a most serious extent with the 80 per cent. unbiassed children that are born into the world. Given a neutral subject, such as Mr. Borham's son evidently was (or he could not have been so sensitive to external influences), and without question it is possible to train that subject to be right-handed, left-handed, or two-handed; and he, or she, will respond equally readily and easily to any one of the three schemes of education that may be employed.

But education, as usually understood, is several steps in advance of nursing, and the subject is treated separately under Section 4 of this Chapter. The suggestion that infantile treatment determines right-handedness fails to establish its claim, being contrary to common experience.

2. The Result of Practice in Writing and Drawing.

Mr. R. Brudenell Carter remarks, "It may safely be laid down that the superiority of the right hand over the left, for purposes of free manipulation, is almost entirely due to the cultivation of the muscles of the former by the practice of writing and drawing."

It must not be supposed that this eminent surgeon intends it to be understood that "the practice of writing and drawing" is "entirely" responsible for the prevalence of right-handedness, but that with modern and civilized peoples it forms the chief factor in the promotion of dextral pre-eminence. That writing is a vital element in manual dexterity; more, that it is the most essential function in hand-training, we strongly affirm, and it is gratifying to have the dictum of such a distinguished surgeon in support of our contention; and that drawing, likewise, plays a most important part in the process is, we think, equally true (see Chaps. II. and III., Pt. II.); but when it is remembered that one-handedness and right-handedness were in vigorous existence ages before writing and drawing were known, and that both of these phenomena (hand developments) are still prominent in heathen tribes where the arts have not penetrated, we must grant that, however strong may be the effect of the practice of writing and drawing in educated communities, that "practice" can only be regarded as a subordinate aid, a supplementary adjunct in the great economy, or potency, that has hitherto eluded our keenest and severest investigation.

Moreover, it is hardly necessary to point out that this theory entirely fails when applied to either the 3 per cent. left-handed, or the 17 per cent. strongly right-handed persons who are respectively left-handed and right-handed, irrevocably so, long before they take a pen into their tiny fingers, and who cannot be made other than what they are by nature; no, not by all the writing and drawing practice of a lifetime.

3. An Acquired Habit.

It is surprising how in this controversy so many eminent men, experts and specialists, propound and advocate opposing opinions; and, at the same time, how firmly convinced each opponent is that his own theory, **and none other,** must be the true one. This confident assurance of belief runs through almost every type that will be examined.

Sir Thomas Brown declares that dextral pre-eminence has "no regular or certain root in nature," that it does not exist in children, and that in adults it is the result of institution and not of nature, "for it is most reasonable for uniformity and sundry respective uses that men should apply themselves to the consistent use of one; for there will otherwise arise anomalous disturbances in manual actions, not only in civil and artificial, but also in military affairs and in the several actions of warfare."

Possibly Sir T. Brown may be right in using the terms "regular" and "certain," but that both dextral and sinistral pre-eminence have a "regular" and very "certain" root in nature cannot be gainsaid, in those seventeen and three persons out of every hundred already alluded to, and whom nothing—not even the most drastic measures that can be applied—has ever been known to change or cure.

Mr. Borham's case, just quoted, would appear to substantiate Sir Thos. Browne's pronouncement, so far as the

80 per cent. neutrals are concerned; i.e. so far as it demonstrated the possibility of such a cause producing such an effect; but Dr. Humphrey, of Cambridge, in his two published lectures on "The Human Foot and the Human Hand," presents a somewhat modified form of the argument. This gentleman has given much time to the study of the anatomy of these members, and therefore speaks with authority. He replies to the question, "Why is man usually right-handed?" as follows:—"I do not think that a clear and satisfactory explanation of the fact can be given. There is no anatomical reason for it with which we are acquainted. Is the superiority of the right hand real and natural, that is congenital, or is it merely acquired? I incline much to the latter view, because all men are not right-handed; some are left-handed; some are Ambidextrous; and **in all persons, I believe, the left hand may be trained to as great expertness and strength as the right.** It is so in those who have been deprived of their right hand in early life; and most persons can do certain things with the left hand better than with the right. Nevertheless, though I think the superiority of the right hand is acquired, and is a result of its more frequent use, the tendency to use it in preference to the left is so universal that it would seem to be natural. I am driven, therefore, to the rather nice distinction that though the superiority is acquired, the tendency to acquire the superiority is natural"!!!

It is no wonder that Dr. Humphrey has recourse to a little *finesse* to help him over the difficulty of his position; but, unfortunately for him, the ambiguity of his conclusions does not confirm his assumption, but the rather very materially weakens it. There is no necessity at this stage for extricating the doctor from his dilemma; but we most heartily endorse his theory that right-handedness is acquired, when it is applied to a certain section of the race, as will appear shortly.

4. Primitive Warfare, aided by Education and Heredity.

Dr. Pye-Smith, writing in 1871, suggests that the mode of fighting in primitive times with club or spear was the original cause of the selection of the right hand, and that this being so, education, together with hereditary transmission, is sufficient to explain its continuance.

Dr. James Shaw remarks:—"From my own observations I am convinced that right-handedness is almost altogether a matter of teaching. It is the vogue to make the child use his right hand from infancy. He will just as readily use his left if articles are frequently put into that hand and its use is unrestricted. Care has to be exercised not to overdo the training of the left through anxiety to counteract the efforts of others on the right. My last case is that of my own little boy, aged two and a half years, who can throw, pull, push, or wield a stick or whip equally well with either hand; but is inclined to take a spoon to eat soup, &c., or a pencil to draw strokes, in his left hand, and is a trifle more expert with it than the right in the use of these articles. This tendency will, no doubt, with a little extra care be quite overcome. I intend that he shall, when old enough, learn to write with both hands." (Letter to the author, 1902.)

A nameless writer in "Cornhill" (1881) thus expands the above idea: "Man is what he is by his own right hand. There was a time when he was practically Ambidextrous. Why and how has he become lop-sided and one-handed?" Thus the writer in "Cornhill," and he proceeds to answer his own question in a somewhat curious manner, for he says, and seriously too, that the whole business takes its rise in the various contests that were waged between the men of those remote ages for possession of certain women whom they wished to make their wives. Two, three, or possibly more of these pristine warriors would accidentally place their affections upon the same fair savage; and as all

modes of arbitration save one were unknown in those benighted times, the dusky rivals would engage in a sanguinary battle with clubs or flint-headed spears until all but one survivor were slain. Now, in these struggles and duels—of every-day occurrence—we are told that the weapons were rude, and the style of warfare coarse and crude; but that both weapons and warfare so conduced to the development of right-handedness, that in the opinion of the writer under review, "From this simple origin, then, the whole vast difference of right and left in civilized life takes its beginning."

And still later, Sir James Sawyer (1900) presents his version of the same idea:—"I venture to suggest, however, that the normal position of the heart is the efficient cause, or, at least, a chief cause, of the prevalent right-handedness. In the earlier days of the human race, when 'those may take who have the power, and those may keep who can,' we were a fighting people, a people fighting hand to hand. In such fighting, a weapon such as a stick or a sword was used. It is an advantage in so fighting to fight with a stick or with a sword which can be used by one arm and hand only, the other arm and hand being used for balance, for defensive covering, or for offensive seizing. The right hand is preferred for wielding of the stick or sword, so that the heart may be kept away, as far as possible, from the assault of the adversary. So arising, right-handedness would thence be transmitted by imitation, and by the hereditary transmission of an acquired peculiarity."

Sir Daniel Wilson follows the same lines to some extent, when he says:—"The conclusion I am led to, as the result of long observation, is that the preferential use of the right hand is natural and instinctive with some persons; that with a smaller number an equally strong impulse is felt prompting to the use of the left hand; BUT THAT, WITH THE GREAT MAJORITY, RIGHT-HANDEDNESS IS LARGELY THE RESULT OF EDUCATION."

Dr. Dwight replies to this so forcibly that he shall speak for himself:—"The theory just now in fashion—another of the Jack-in-the-box order—sets forth that it was discovered in the early days that wounds of the left side of the body were more deadly than those of the right. Hence it was prudent to carry the shield on the left, and the sword or spear in the right hand, which in time acquired its characteristic superiority. It seems cruel to break so pretty a butterfly on the wheel of criticism, but it must be denied, in the name of anatomy, that there is more than a very slight difference in the danger of wounds between the two sides. In the next place, even if the premise were correct, there is no evidence that primitive tribes advanced against each other like pasteboard soldiers. On the contrary, there is every reason to think that they often attacked their enemies from the side, or even from behind. That spears and arrows pierced the foemen from right to left, and from left to right, and at every degree of obliquity, is beyond question. To have tabulated the results would have taxed the skill of learned and able surgeon-generals; but according to this theory, ignorant and brutal savages made the generalization, and apparently made it in many places. Can credulity go further? But even if we admit the theory, how are we to account for left-handed men? Why were they not killed off? Were they wicked and perverse people who refused to listen to the good prehistoric surgeon-general, when he told them to carry the shield on the left, and who, through some lapse of justice, escaped their deserts? The latest suggestion is, that as it happens oftener on the right than on the left, the eighth rib is continued to the breast-bone instead of joining the one above it, as it ought to; this would in these exceptional cases make the right side a little more stable support; but the effect at best, would be very slight, and the theory is purely fanciful.

"If there be some such anatomical cause for the choice of the right hand—and it might be rash to say certainly

there is not—it is at least none that to the writer's knowledge has ever been advanced."

The above criticism seems to be final, from the doctor's standpoint. There are, however, other aspects in which this theory may be viewed, in which the conclusions are just as forcible and fatal to the hypothesis.

It has been said that of every hundred persons born into the world, about **seventeen of them are naturally right-handed**, i.e. they have an instinctive and irresistible impulse, from the earliest period of discrimination, to use the right hand rather than the left, and they do so without effort or intent, that is naturally or instinctively; not quite three out of the hundred will possess just as strong an inclination to use the left hand in preference to the right, and they do so, also without effort or intent, i.e. instinctively or naturally: the remaining **eighty** individuals are born without any pronounced preferential impulse towards either hand. The legitimate inference from this is that the eighty unbiassed persons will be amenable to education, and can be made either right-handed, left-handed, or two-handed as their teachers shall decide. This proportion of right, left, and either-handed people may be accepted as approximately correct —and in the discussion it will be received as such. Then how does this fact bear upon the proposition that present day right-handedness is the result of education and training? It certainly has a considerable influence in deciding the future manual skill of the eighty neutral infants—though there are other powerful elements and determining factors, as we shall see later on, which go to produce the right-handed man; but what about the others? The seventeen biassed ones will grow up right-handed without the aid of education or training; they are born so, and do not need the education; whilst for the three left-handed unfortunates (so contemplated by the majority of their fellows), must we regard them as exceptions that prove the rule? There is much to

support the idea that **right**-handedness can be, and is effected through education, for we find pianists, surgeons, jugglers, completely successful in training the **left** hand to an equal efficiency and dexterity with the right—indeed to such an extent that none but the performer himself can detect any difference. On the other hand, it is an undoubted truth that neither training, education nor pressure of the sternest kind can either cure or modify pronounced one-handedness, be it dextral or sinistral. Sir D. Wilson records an instance of two parents who were resolved that their children should **not** become left-handed (as they themselves were), and hence with their first infant, a boy, they adopted such measures as they thought would be successful in preventing what they looked upon as a misfortune or calamity. When, therefore, the first manifestations of a sinistral preference were recognized, the child's left hand was confined, bound up or tied behind him, and this coercive treatment was persisted in to such an extent that it was feared the limb was permanently injured. It was all in vain; when the arm was released, that moment it asserted its superiority; and the case is typical, for, as we have said, in no authenticated instance has a declared or recognized bias been removed or counteracted, and it has been found as impossible to transform a sinistral hand into the dexter and *vice versa*, as it would be to train the eye to detect sounds, or the ear to distinguish colours.

Then, again, with the eighty unbiassed persons, whilst education, supplementing the pressure and influence of both nature and mother, will account for the right-handedness of civilized nations, how could, and can, education assert itself in heathen or barbarous races where schools are not, and where any systematic instruction is quite unknown? And what about the women? Surely our theorists are neglecting the most important element in the controversy! It is the mothers who exercise the greatest influence on the children and make them what

they become. Originally, even as now, women are far more two-handed in dexterity than men, and we are forced to admit that primarily they must have been practically Ambidextrous. Would not their influence and example have completely counteracted the tendency to right-handedness which rare occasions for fighting by the men on behalf of a prospective wife might create? Surely these dusky warriors were not fighting for wives every day of their lives, every month, or even every year! And there would be so many other occupations, in which they themselves would daily engage, to command the use of both hands, and in which two-handed skill would be of the utmost value, as to effectually destroy the ephemeral bias that a few days' fighting might produce. We say that the girls and women, who far outnumber the men, constitute a **factorial** obstacle and difficulty in this theory of warfare and education, &c., that is almost insurmountable, and that at any rate, as yet, has not been taken into calculation. Female influence is all but paramount, and if, as Stanley tells us, the savages of Central Africa find it to their advantage to retain the Ambidexterity of both hands unimpaired, so that they can throw the spear or (and) hurl the knobstick equally truly with either hand, we may be sure that primeval savages would be quite as intelligent and competent to appreciate and retain it also.

Obviously it follows that in any kind of warfare—more especially in the personal contests of which the "Cornhill" contributor speaks—dexterity with the left hand would frequently give the combatant an overwhelming advantage were his adversary unable to oppose to him an equal sinistral skill; so this entire argument fails to establish its claim to our acceptance on each and every count, more particularly when it is remembered as incontrovertible truth, that it is just as easy to fight well, and perfectly well, with the left hand and arm as with the right; that the 700 left-handed Benjamites were the finest band of

soldiers in the Israelitish nation; and that for a man to be able to fight with both hands at once equally well, and to fight perfectly with his remaining hand (whichever it may be) when the other has been placed *hors de combat* must give him a value and superiority that his one-handed fellow or adversary can never hope to approach, much less rival.

5. Hereditary Impulse.

Mr. R. A. Lundie is so convinced "by frequent experience" that the peculiarity of left-handedness is hereditary, "that we could not be much surprised if a race were met with in which left-handedness was the rule and not the exception."

Mr. R. A. Lithgow writes:—"As a proof of this hereditary predisposition, I have only to refer to my own family, where the eldest son for three generations at least has been left-handed, viz. my paternal grandfather, my father, and myself; the first mentioned being the best marksman of his part of the country, although he fired from his left shoulder, as I do myself."

Dr. D. J. Cunningham believes one-handedness to be hereditary, whether it be dextral or sinistral. "Left-handedness appears to be hereditary and to run in families;" and he cites the following very curious cases in support of his opinion:—

"Aimé Péré gives two very remarkable instances of left-handed families. (1) A left-handed man married a left-handed wife. Of the five children which were born of this marriage, four were left-handed, and one, a daughter, was right-handed. There were also three cousins of this family who were left-handed. (2) A sailor who was left-handed, had a right-handed father and a left-handed mother. He had seven brothers and six sisters, all of whom were left-handed. In the family of the mother, the father, two girls, and three boys were left-handed; in the family of the father, one brother was left-handed, and he

had five children, all of whom were left-handed. In this family, therefore, there were twenty-five left-handed individuals." (Journal of the Anthropological Institute, p. 280.)

And again :—" Right-handedness is an inherited quality in the same sense that the potential power of articulate speech in man and of song in the bird are inherited possessions." (Journal, p. 281.) Also, " That the use of the left hand is transmitted from parent to child, and so, like other peculiarities, is, to some extent, hereditary is undoubted." (Sir Daniel Wilson.)

A Fellow of the Royal College of Surgeons, in a short letter to the " British Medical Journal," states that his " mother was left-handed " and his " father right-handed. I am, as a surgeon, Ambidextrous. My eldest girl is left-handed; my second girl is also left-handed; my third child, a big strong boy, absolutely left-handed; and my fourth, a girl, is utterly left-handed too."

Dr. W. B. Hadden, F.R.C.P., states that he has " seen occasional instances of hereditary preferential use of the left hand," and this has been the experience of scores, nay hundreds, of other medical men. But what is to be said of Dr. Lundie's conviction, of Mr. Lithgow's proof, of the personal case given by the F.R.C.S., when we read the account of Dr. Ogle's labours, which we reproduce *in extenso*, being so valuable, because embracing so many individuals taken promiscuously? Dr. Ogle " went through the tedious task of asking 2,000 consecutive hospital patients (1,000 men and 1,000 women) whether they were right or left handed. Of the 2,000 no less than eighty-five were left-handed (that is 4½ per cent.). Of the whole eighty-five, no more than twelve had a left-handed parent." So that out of nearly a hundred left-handed individuals taken from 2,000 consecutive hospital patients, 14·1 per cent. only could trace the peculiarity to their parents.

This very independent, but also comprehensive, test

would seem to dispose finally of the "Hereditary" theory, although Dr. Ogle's next recorded investigations are equally strong in supporting the view that "left-handedness" affects certain families, whilst it leaves the majority of families unmolested.

"Of fifty-seven left-handed persons of whom I made inquiries as to their relations, no less than twenty-seven knew of one or more left-handed relations within the degree of first cousin. Most of these fifty-seven were hospital patients, and these were rarely informed as to the whole number of their uncles, aunts, and cousins. But even as it is, in practically half of the left-handed cases, the 'affection' was sporadic in the family."

Dr. Ogle gathers from these results "that left-handedness resembles abnormalities of bodily structure in its running in families." It resembles them also in another way, viz. by attacking the two sexes with different frequency. "Of the 1,000 men of whom I made inquiries, fifty-seven were left-handed; of the 1,000 women, only twenty-eight. In other words, this peculiarity is twice as common in men as in women. Now a precisely similar phenomenon is observable in the case of undoubted malformations, such as congenital talipes, which affects three boys to one girl; extroversion of the bladder in eight boys to three girls, and polydactylism in two men to one woman. Inversion of the viscera similarly is more often found in men than women."

All the foregoing evidence, it will be seen, relates to left-handedness, which peculiarity is distinctly proved not to be hereditary, but to be irregular and sporadic. Now, if left-handedness, which is an incurable affection, is not transmitted hereditarily, neither can right-handedness be, for in its pronounced form it is an exactly similar irregularity or abnormality, only it affects the other hand and is more commonly met with, in the ratio of about five to one.

It cannot be denied that in some cases left-handed

parents have left-handed children, but it is much more usual to find their children right-handed; and quite as common, if not indeed more so, to meet with right-handed parents having left-handed offspring.

Surely, if heredity were a determining factor in the product, these constant and numerous violations of the law could not occur. There might be occasional deviations from the parent type, but they would be conspicuous by their infrequency, and not as at present by their great predominance; and, lastly, cases of prolonged hereditary descent or of a series of left-handed generations in any one family are so extremely rare as to be practically unknown, whilst, according to the theory, they ought to be just as prevalent and familiar.

The theory of hereditary transmission therefore falls to the ground, being contrary to experience and unsupported by facts.

6. A Mechanical Reason.

Professor Buchanan, of Glasgow, is responsible for this theory of "A Mechanical Reason," which he enunciates as follows:—"The inclination of the 'Centre of Gravity' of the body to the right side confers a mechanical advantage on the limbs of the right side in their complex movements, while it is mechanically disadvantageous to the limbs of the left side in the analogous movements which they perform." This law, he observes, is based on the following premises:—

1. The centre of gravity of the body is situated, not in the mesial plane, but to the right of it.

2. A deep inspiration is necessary to every great muscular effort.

3. There is a shifting of the common centre of gravity of the body obliquely backward and to the right on making a deep inspiration.

4. More general view of the utility of the act of

inspiration in shifting the position of the centre of gravity in subservience to the movements of the body.

5. The kind of respiration which accompanies the action of the limbs of the right side is more favourable to sustained muscular exertion than the respiration which accompanies the action of the limbs on the left side; and the argument he gives in these words:—"It thus appears that the preferential use of the right hand is not a congenital, but an acquired, attribute of man. It does not exist in the earliest periods of life." Nevertheless he thinks that "no training could ever render the left hand of ordinary men equal in strength to the right"—[this assumption is quite contrary to all physical law and to all common experience; for it is obvious to every one that were the left hand to be subject to the requisite training, exercises, and practice, and the right to a similar extent neglected, the latter would prove weaker, whilst the former, the left hand, would proportionately develop and increase in power and dexterity. Says Dr. Cunningham:—"It is matter of common knowledge that the more extensive use to which the right upper limb is put reacts upon its development and causes it to assume more massive proportions than its fellow on the left side" (Journal of Anthropological Institute, vol. xxxii. p. 279), and it follows that if the operation be reversed, the left arm and hand will acquire the superior muscular and massive development instead of the right]—for, "it depends upon mechanical laws arising out of the structure of the human body." This "Mechanical Theory" is thus explained. In infancy and early childhood there is no difference in power between the two sides of the body; but so soon as the child becomes capable of bringing the whole muscular force of the body into play "he becomes conscious of the superior power of his right side . . . a power not primarily due to any superior force or development of the muscles of that side, but to a purely mechanical cause. He cannot put forth the full strength

of his body without first making a deep inspiration; and by making a deep inspiration and maintaining afterwards the chest in an expanded state, which is essential to the continuance of his muscular effort, he so alters the mechanical relations of the two sides of the body that the muscles of his right side act with a superior efficacy; and to render the inequality still greater the muscles of the left side act with a mechanical disadvantage."

Hence the preference for the right side whenever unusual muscular power is required, and with the greater exercise of the muscles of the right side, the consequent development with the full predominance of the right side is the result.

This theory is based not merely on the disposition of the lungs of the right side, but on these further facts, viz. that the right lung is more capacious than the left, having three lobes, whilst the left has only two; that the liver, the heaviest organ of the body, is on the same side; and that the common centre of gravity of the body shifts more or less towards the right according to the greater or less inspiration of the lungs, and the consequent inclination of the liver resulting from the greater expansion of the right side of the chest. The Doctor continues:—"It may be asked, if men use their right hands, not from habit, but from a mechanical necessity, how it happens that sometimes men use their left hands rather than their right. It seems to me probable that many such cases, as in the left-hand slingers of the tribe of Benjamin, are merely cases of Ambidextrousness, where the habit of using the left side, in whatever way begun, has given to the muscles of that side such a degree of development as enables them to compete with the muscles of the right side in spite of the mechanical disadvantages under which they labour. There is an awkwardness in the muscular efforts of such men which seems to indicate the struggle against Nature. There are, however, unquestionably, as I believe, men

who use their left limbs with all the facility and efficiency with which other men use their right.

"Pathological Anatomy furnishes us with a complete explanation of this anomaly in certain cases. There are men born, who may grow up and enjoy perfect health, in whom the position of all the thoracic and abdominal viscera is reversed. There are three lobes of the left lung, and only two of the right, the liver is on the left side, and the heart on the right, and so forth. Now, individuals so constituted, must use their left limbs most effectively from a mechanical necessity, just as other men use their right.

"There are other malformations and pathological lesions, particularly those occurring in early life, which must naturally influence the relative power of the two sides. Such are: diseases of the right lung; contraction of either side of the chest from pleurisy; enlargement of the spleen, particularly when, as often happens, it is accompanied with a diminished size of the liver; distortions of the spine, with consequent displacement of the viscera; and many others."

Sir Daniel Wilson so effectually disposes of this hypothesis of Dr. Buchanan's that we reproduce his criticism almost verbatim. He says:—"Herein may possibly be a slight predisposing cause leading to a preferential use of the right side. But the evidence adduced altogether fails to account for what, on such a theory, become abnormal deviations from the natural action of the body; and the unsatisfactory nature of the theory, as a solution of right-handedness, is placed beyond doubt when it is applied to these cases of deviation from the normal action which is assumed to result from it and to render right-handedness a mechanical necessity. There are men enjoying perfect health in whom the position of all the thoracic and abdominal viscera is reversed. There are three lobes of the left lung, and only two of the right; the liver is on the left side

and the heart on the right. I have long been accustomed to take note of left-handedness, and have never known a case where it could be accounted for in this way, while cases of ascertained transposition of the viscera are on record without any corresponding left-handedness. The cases hitherto observed are in all so very few, that without the invariable accompaniment of the left-sided lungs with left-hand action, the argument is of no value.

"Moreover, in normal cases and under normal conditions, observation fails to corroborate the theory. Taking particulars of ship porters in the lading and unlading of vessels, I found that 137 carried the burden on their left shoulders and eighty-one only on the right, whilst on another occasion the figures were seventy-six left to forty-five right, which is absolutely the same ratio. In the case of loading cordwood, where the natural action of the right hand is to place the burden on the left shoulder, and where, therefore, the use of the right shoulder implies the use of the left hand, the numbers were sixty-five using the left shoulder to thirty-six using the right. Here, therefore, a practical test of a very simple yet valuable kind fails to confirm the idea of any such mechanical cause inherent in the constitution of the human frame, tending to a uniform exertion of the right side, and the passive employment of the left in all muscular action."

Since the question of "Transposed Viscera" is treated in a separate section, it would be out of place to continue the discussion in connection with the present argument.

We may take it, then, that the "mechanical" assumption does not harmonize with ascertained facts, and does not satisfy the conditions required by them.

7. Organic Structure.

There is quite an imposing array of writers holding the view that one-handedness is caused by some peculiarity

of organic structure. What that peculiarity is they do not undertake to say, but that their contention is correct in relation to those 3 per cent. left-handed and seventeen right-handed persons in every hundred, already alluded to, must be conceded almost without qualification.

Aristotle contends that the organs are more powerful on the right side.

Dr. Wyeth, of New York, declares that "Man is right-handed by preference, as a result of his anatomical development."

Sir Daniel Wilson's observation—after he has taken a review of the numerous conflicting theories as to the cause or causes of right-handedness—is that "the inevitable conclusion forced on the inquirer is that the bias in which this predominant law of dexterity originates must be traceable to some speciality of organic structure." As to the nature of this special organic structure, he concludes:—"It is curious indeed how physiologists and anatomists have shifted their ground from time to time in their attempts at a solution of what has been very summarily dismissed by others as a very simple problem, until, as Dr. Struthers remarks: 'It has ceased to attract the notice of physiologists only because it has baffled satisfactory explanation.'"

The position taken up by these authorities is so general and indefinite, and, as we also think, so obvious and unanswerable, that it would be superfluous to criticize it. And it is not perhaps premature to state here and now that our own assured conviction is that both right and left-handedness are entirely due to some **peculiarity** of organic Structure or of Anatomical development. More of this anon.

8. A Natural Endowment, or an Original Instinct.

Sir Benjamin Brodie affirms that right-handedness is "an Original Instinct."

Sir Chas. Bell asserts that the left side is more subject to attacks of disease than the right, and "on the whole the preference of the right hand is not the effect of habit, but is a natural provision, and is bestowed for a very obvious purpose."

Dr. Dwight expresses his ideas on the matter in the following words:—"The impulse to use a particular hand rests on something more subtle than mere size. All attempts to account for it by purely mechanical theories have failed completely. It is an instinct, an inborn impulse, with which reason and education have nothing to do. Side by side with this instinct exist the various departures from symmetry which have been discussed. Some of them, such as the finger-markings, are congenital; others, as the unevenness of the face, appear later, and very probably are influenced by mechanical causes; others, again, like the unequal development of the two sides of the brain, perhaps depend on the laws regulating growth. The impulse to prefer one side would, in many cases, lead to its greater development, but, as just shown, it does not in all.

"Like other instincts, that of right-handedness has its advantages. It is clearly a good thing that when a movement is to be made, there should be no hesitation which side is to start first; that we should not stand fixed, like the hypothetical donkey, starving, between two equidistant and equally attractive bundles of hay. It is possible that the want of symmetry (itself to some extent due to unequal use) may in turn help the manifestation of this impulse to use one side, but the impulse exists first. This is proved by the occurrence of left-handedness, and of exaggerated right-handedness, even in the nursery. Education, though it cannot uproot the tendency, restrains it. The characteristics of an educated left-handed person, which would first attract attention, are more likely to come from an uncommon ability to use the left hand, than from any deficiency in the right.

Thus a billiard-player who makes a shot with his left hand as well as with his right, was probably originally left-handed. He is called Ambidextrous; but the fact is, that his right hand has been educated as the left hands of most people have not. His right arm may even be the larger. The inborn impulse does not show, but it still exists none the less. The most perfect Ambidexter I ever knew, whose skill in writing and drawing with either hand is proverbial, has declared that he cannot drive a nail, carve, or whittle with his right hand.

"Want of symmetry between the sides is something essentially different from right-handedness. The latter is seen in function, not necessarily in form. Wrongly considered a human characteristic, it is found more or less developed in animals, and something analogous to it exists even in plants." [In the previous chapter on Symmetry and Asymmetry this right-handedness, or right-sidedness (to be more exact) in animals has been disputed, if not indeed satisfactorily disproved.] "To call right-handedness an instinct may seem to some an evasion of the question, an explanation which does not explain, but this criticism is not just. We, at least, have seen what right-handedness is not. We call certain phenomena electrical, though we do not know what electricity is; and in the same way we may call others instinctive, though we must content ourselves with defining instinct as an inborn impulse to certain actions, for the benefit of the individual, or his descendants, depending neither on reason nor experience. When we understand instinct, then, and no sooner, we may hope to understand right-handedness, and to know why it is sometimes reversed."

Dr. Dwight is at such pains to explain his meaning and to establish his theory that his remarks deserve special recognition, and a separate reply before the general criticism, which will deal with all three exponents collectively.

Being firmly convinced that right-handedness is an instinct, he is so anxious and determined to prove the advantages of instinct in general, and of this right-handed instinct in particular, that he actually enlists the services of the hypothetical donkey to clench the nail of his argument :—" It is clearly a good thing that, when a movement is to be made, there should be no hesitation which side is to start first, that we should not stand FIXED like the hypothetical, &c., &c."

Surely the Doctor is joking ; for he would otherwise be in danger of insulting the common sense of his least intelligent reader by supposing the possibility of such an absurdity as a person hesitating, like an ass, which hand to use first, in any office or function where both were equally available, and both were also equally competent to act. Even as things are under existing conditions, do we experience the least degree of uncertainty, much less of hesitancy, in the preferential use of a hand in the common every-day duties of life, say at the dinner-table ? Is there not such an instantaneous recognition of the fittest, or most appropriate hand to employ (in every known case of dual possibility) that it may be called instinctive ?

As an illustration, from an analogous act that occurs many thousands of times in every man's life, when a person is standing and he wishes to remove, or locate, himself elsewhere by walking, does he assume the attitude of the proverbial " brayer " to ask which foot he shall move first, or which foot is the preferable one to start with ? The whole proposition is ridiculous in the extreme. If the Doctor had thought for a moment, he would have seen the weakness of his suggestion. Does the monkey, for instance, in any of its manifold and marvellous evolutions (we take the Coaita as an example) pause or hesitate ? Dare it, could it, in the lightning-like movements that characterize it, stay to decide whether its amazingly delicate and prehensile tail or its hands should

grasp an object or seize a branch; and if the hands (it has FOUR so-called), does it wait a second time to determine which of them is the right one to use? **Incredible!!**

Therefore, if in these exceptionally rapid motions, with FIVE available, and equally available, members, all equally adapted for the purposes of swinging, grasping, &c., the Coaita is **never for a moment** at a loss which one to use at the instant, is it conceivable that man with only TWO hands, and with his sedate and comparatively slow movements, will, if made Ambidextrous, become extinct through the law that "HE WHO HESITATES IS LOST" working on the race to decimate and destroy; and because he is so continually mixed up with his two dextrous hands (an evident superfluity of good things!) that he positively loses his powers of discrimination, and, overwhelmed by his two-handed faculty, is unable to decide which of his manual limbs he shall use on any critical occasion? Perish the thought. This suggestion by the Doctor, therefore, must be dismissed as unfounded, fanciful, extravagant, and impossible.

These three authorities are either ignorant of, dispute, or ignore the fact that only twenty persons out of every 100 are born with this inherent one-handed bias which emphatically differentiates the two hands, rendering the right hand so obviously superior in seventeen of those persons, and making the left hand equally superior in three of them; and that the remaining eighty, or four-fifths of the entire race, are uninfluenced by any such irresistible impulse. Is it not quite contrary to reason and to nature, that the departures from any normal type shall be taken as characteristic of that type; that the **one-fifth** shall be accounted the "Instinct," the "Natural Endowment," and that the **four-fifths** shall be relegated to the back place as malformations, aberrations, or even as monstrosities?

No! We must maintain, reasoning from analogy, that man was originally created practically symmetrical; that

the functions and powers of the dual limbs and organs were also practically identical. "The primitive condition we must suppose to have been one of perfectly symmetrical structure and Ambidextral function, for this is the condition of all the higher vertebrates which can be best compared with man ; complete bilateral symmetry of all the organs is the state of the human embryo at an early stage," and therefore that right-handedness cannot be an " Instinct or Endowment " as suggested.

Moreover, and lastly, an Instinct or a Natural Endowment would necessarily show itself and assert itself in the child from the very beginning of conscious manipulation. **A Duckling swims perfectly at the first attempt**; original instincts do not develop slowly by cultivation, they act perfectly at the earliest stages, and hence right-handedness, if an endowment, should appear with the child's first efforts and be as **dis**tinctive as it is said to be **in**stinctive ; but since this dextral pre-eminence does not show itself as a rule in the first two or three years of the infant's life, it can hardly be deemed an original instinct or a natural endowment.

9. Visceral Distribution, or the Unequal Distribution of the Viscera.

This theory, dating back as far as 1828, when it was advanced by Dr. Von Baer—afterwards it was adopted by Forster and since then advocated by several—runs generally as follows :—" The development of right-handedness is due to the difference in weight of the two lateral halves of the viscera of the human body, which tends to bring more strain on one side than on the other, and so to give more exercise to that side."

Sir James Sawyer observes :—" It is very likely that Sir John Struther's reason . . . for the general use of right-handedness, may have some validity, namely, that the thoracic and abdominal contents of the right side of the

vertical middle plane of the human body are heavier than the contents on the left side, so that the greater weight on the right side leads to resting most on the right leg, and from the pillar of support we naturally use the right upper limb preferentially."

Sir John Struthers took great pains to accurately weigh the viscera on both sides of the body, and he found, after the most carefully conducted experiments, that the viscera on the right side are some $22\frac{3}{4}$ oz. heavier than those on the left side, that this difference is reduced some $7\frac{3}{4}$ oz. by the influence of the contents of the stomach, leaving a clear preponderance of at least 15 oz. in favour of the right side.

He takes separately the liver, spleen, pancreas, kidneys, lungs, heart, great bloodvessels and intestines, the complete figures being :—

Total weight of the viscera on the right side .	$50\frac{3}{4}$ oz.
Total weight of the viscera on the left side .	28 oz.
Visceral preponderance of right side .	$22\frac{3}{4}$ oz.
Deduct for contents of stomach . . .	$7\frac{3}{4}$ oz.
Total preponderance of right side . .	15 oz.

After devoting some paragraphs to "The Symmetry and Equipoise of the right and left sides zoologically and developmentally considered," the learned author concludes :—"Meanwhile I content myself with having shown that from the arrangement of the viscera, the body is considerably heavier on the right side than on the left, with the consequent position of the centre of gravity to the right side of the middle line, whatever the result of this fact may be. As a physical agent constantly in operation in the erect position it cannot but exert an influence on the attitude and movements of the body and limbs and on the muscles concerned in them."

Mr. Shaw sets forth his view of the case with much lucidity and force in a paper contributed to "Knowledge"

some years ago. We briefly reproduce his argument. He declares that:—

1. There is a difference in lung structure and capacity when we compare the two sides. The left lung has two lobes, the right has three, so that if we inhale 240 cubic inches of air, 130 will be absorbed by the right lung and only 110 inches by the left lung. By this greater expansion of the right lung, the liver, which is about 4 lbs. in weight, is pressed or shifted more to the right side, and this tends also to shift the centre of gravity to that side. Then also the stomach and spleen incline to follow the liver.

2. It has been ascertained by frequent tests that the viscera of the abdomen and chest weigh about 1 lb. heavier on the right side than on the left. Evidently, then, the right foot will be "more leant upon," and if so it will form a steadier basis of action for the right arm than for the left. In accordance with this, a nurse carries a child on her left arm for two reasons; first to balance the greater weight of her right side, and, second, to have the right arm free for exercise.

From these two premises Mr. Shaw argues that right-handedness thus inevitably ensues.

There are two very fatal objections to this plausible theory, and the first is that it assumes evidently that children are not right or left handed before they learn to stand. Such an assumption is opposed to our common knowledge, and is clearly disproved by the experiments of Dr. J. M. Baldwin, which will be described further on, and of other investigators.

The second objection is even stronger and more unanswerable. If the theory is sound, then all persons affected by transposition of the viscera must of necessity be left-handed. The following cases are reported and authenticated (one each) by the following gentlemen:— Drs. Gachet, Gery, Schultze, Pye-Smith, Lees (a boy of eight in 1876), Seymour Taylor (a man of eighteen in

1891), Heron (a man of forty in 1891) Cheadle (a boy of sixteen in 1892), E. C. Carter (an adult in 1893), and Sir W. R. Gowers (in 1902), and in **every one** of these cases the persons were right-handed.

"Aimé Péré has collected details in regard to a large number (about 200) of cases of reversed viscera. Looking over these, I found twenty-eight in which a record of right or left handedness is given. Twenty-three were right-handed and five were left-handed." (Cunningham.)

Some other cases also have been reported, as stated by the Medical Press, but only in one solitary instance was that individual left-handed. And Dr. Pye-Smith writes me that he has met with further cases of transposed viscera, but not one so affected was left-handed, "and in all the left-handed persons I have had an opportunity of examining there was no transposition." Dr. James Shaw also informs me that of the "great many left-handed people" whom he has met, not one of them was other than normal with respect to visceral arrangement. Once more Dr. W. B. Hadden relates a striking case in one of his patients who, though having transposition of the viscera, was right-handed, whilst her twin sister with normal arrangement was left-handed. Stranger still, these sisters had two twin brothers, one of whom was right-handed, and the other left-handed, but neither of them had any displacement of the viscera.

A similar phenomenon is seen in the lower animals, for Dr. Hollis tells us that:—"The monkey tribes, the present representatives of our Simian ancestry (if such they may be) use their right and left limbs indiscriminately to grasp any object offered to them. . . . The thoracic viscera of some specimens of monkeys preserved at the museum of the Royal College of Surgeons, clearly prove that the right lungs of these animals bear about the same relations to their left, as regards their volumes, as do our own. The marmot, again, I have observed to use its left limbs as readily as the right, and yet there is a

greater difference between the proportions of its right and left lungs than there is even in man; whilst in the little musk-deer, the right lung is twice the capacity of the left," nevertheless all these animals are perfectly free from bias to either side in their free and unrestrained activity.

Also Dr. Cunningham:—"In the ape, especially in the anthropoid members of the group, the viscera are disposed in a manner very similar to that characteristic of man. In the ape, the centre of gravity also lies to the right of the mesial plane, and seeing that the hand is not utterly devoted to locomotion, but is endowed with many of the capabilities which distinguish the human hand, it would not be unreasonable to expect a certain amount of preference developed for the use of the right upper limb." (Journal, p. 285.)

Mr. Shaw, and those who agree with him, urge their case and plead their cause with so much ingenuity and force, that one is almost compelled to grant that there is at least some virtue in their hypothesis; but in the face of these substantiated cases of transposition of the viscera, where the effects are so contrary to the hypothesis, it is impossible to accept the theory, or to credit the right side preponderance of, say, 1 lb., avoirdupois, with any part whatever in the production of right-handedness.

And yet Sir J. Struthers supports Mr. Shaw, and is of opinion that "this deviation of the centre of gravity, from the unequal weight of the viscera on the two sides of the body, furnishes the most probable solution!"

10. Arrangement of the Bloodvessels.

The celebrated Dr. Hyrtl, anatomist of Vienna, affirms "a correspondence between the ratio of left-handed persons, and the occurrence of certain deviations from the normal arrangement of the bloodvessels," and he gives statistics to support his views.

Dr. Barclay's theory has been propounded by his pupil, Dr. Buchanan :—"The veins of the left side of the trunk and of the left inferior extremity, cross the aorta to arrive at the vena cava, and some obstruction to the flow of the blood must be produced by the pulsation of that artery." To this Dr. Barclay "traced indirectly the preferential use of the right side of the body, and especially of the right hand and foot." "All motions," he stated, "produce obstruction to the circulation ; and obstruction from this cause must be more frequently produced in the right side than in the left, owing to its being more frequently used. But the venous circulation on the left side is retarded by the pulsation of the aorta, and therefore the more frequent motions of the right side were intended to render the circulation of the two sides uniform."

Sir Daniel Wilson's comment on this is that "the idea, if correctly reported, is a curious one, as it traces right-handedness to the excess of the compensating force for an assumed inferior circulation—pertaining naturally to the right side."

At the same time it must be confessed that this theory which declared right-handedness to be natural and left-handedness to be abnormal, or a deviation from natural law, is very plausible, as it accounts both for right-handed and left-handed people, but it must not be forgotten that statistics to prove the hypothesis are entirely lacking, and would seem also to be practically inaccessible and unattainable.

11. Brain One-sidedness.

Dr. W. Ogle, whose valuable contribution to the discussion we have previously alluded to, and with whose deductions on some practical aspects of the question it has been found impossible to agree, is convinced that "there can remain no fair doubt but that right-handedness **depends** on some predominance of the left brain, and

that left-handedness, when it occurs, depends on a transposition of this structural peculiarity, whatever it may be."

Proceeding next with the inquiry as to what this "predominance" or "difference" may consist in, the Doctor adduces much valuable evidence, after which his final pronouncement is given in the following words :—"There remains, then, no possible doubt but that right-handedness and left-handedness are associated respectively, the one with a more highly developed left (brain) hemisphere, the other with a more highly developed right one."

The result of Mr. James Shaw's investigations is to convince himself that "the balance of the evidence is in favour of the constitution of the brain itself being **a reason** of right-hand predominance."

Dr. W. C. Cahall has stated his argument most forcibly in the "Popular Science Monthly" of New York some time ago. He says :—"In my belief there is a physical **cause** for this uniform habit; a cause demonstrable by anatomical and physiological facts :—

"(*a*) The brain (cerebrum) is divided into two hemispheres.

"(*b*) The nerve-force and nerve-fibres which produce muscular action on the one side of the body have their origin in the opposite hemisphere of the brain.

"(*c*) The left hemisphere, from the earliest period, is larger and heavier than its counterpart, and the convolutions of grey matter (the reservoirs of nervous energy) are more numerous on this side than the right.

"(*d*) This superior development of the left hemisphere as to weight, size, and richness of convolutions, may be attributed to a peculiar arrangement of the bloodvessels, by means of which a greater blood supply is distributed to the brain substance of this side.

"(*e*) The arrangement of the bloodvessels to which I refer is the manner of origin of the right and left common carotid arteries. The carotid artery is a branch of the

innominate artery on the right side, while it springs direct from the aorta on the left. This directness of "communication, in addition to a larger calibre of the left carotid, gives the left hemisphere a decided advantage in the race of development.

"In conclusion, from what we have seen, in answer to the question 'why are we right-handed?' it might be said because we are left-headed."

In support of this theory, Dr. Boyd made observations on the patients in St. Magdalene's Hospital, and weighed separately the hemispheres of 200 persons. He reports that almost invariably the left lobe exceeded the right by an eighth of an ounce in weight. Dr. Wagner, however, found that this left lobe supremacy only occurred in the proportion of three to five, which is an **inferiority.**

In passing, may we not observe that Dr. Boyd's experiments and results are anything but corroborative, if, as we are told on what seems to be reliable authority, lunatics are frequently left-handed; and more than one writer on insanity mentions this peculiarity as a generally recognized fact.

Still further to strengthen Dr. Cahall's position, Dr. Broadbent states that he has "verified the fact" (!!) by numerous examinations, that generally the frontal convolutions are much more complicated upon the left side than upon the right side of the brain—and other writers concur in this opinion.

One might naturally infer from all these statements that this assumption of "Left-brainedness" is the correct one, and that we have at last arrived at a satisfactory solution of the problem—but, strange to say, we have evidence just as weighty in the opposite direction, evidence that appears to be quite as conclusive, and without even the ambiguity or uncertainty that we think attaches to Dr. Boyd's experiments.

Professor Cunningham is remarkably emphatic in his opposition to this supposed superiority in weight of the

left cerebral hemisphere, and he says :—"There is every reason to believe that the predominant weight ascribed to the left cerebral hemisphere by these authorities, is due to errors of observation. Braune has shown in the most conclusive manner that if there is any difference in weight between the two hemispheres, it is a difference in favour of the right, and not of the left. He weighed the cerebral hemispheres of ninety-two brains, and found that in fifty-seven the right hemisphere was the heavier; in thirty-four the left was the heavier; and in one case only were they of equal weight; and I may add that these results are quite in accord with my own observations, and that I believe that the same conditions as to weight are present at all periods of growth and development. We may dismiss, therefore, from our minds the possibility of left-brainedness being due to a greater mass of cerebral substance on the left side of the brain." (Lecture, p. 17.)

Dr. Thurnam states that his weighings did not confirm Dr. Boyd's observations.

Dr. Donaldson, in his elaborate work on "The Growth of the Brain" (1895), remarks, (p. 276) :—"Normally, too, the hemispheres attain nearly the same weight, and there is no evidence that the left hemisphere is persistently the heavier in a right-handed person. The reasons for these relations are, therefore, not evident in the present way of regarding the nervous system, according to which, growth and increase in size are associated with activity. The anatomical arrangement, which was originally responsible for this one-sidedness, has still to be investigated, in order to determine whether the better development of the afferent or efferent structures control the matter in the first instance, and to discover, if possible, how far the physiological processes in the neglected hemisphere may be duplicates of those in the one preferred. At the moment, however, it is not possible to do more than state the difficulty."

The Doctor gives the following table of 301 cases, in

which the figures, if reliable, are fatally decisive against the theory of weight-preponderance (p. 185) :—

"Table giving the number of cases in which the hemispheres were equal in weight, or one of them in excess, in a series of Italian brains weighed by Franchesci (of Bologna, 1885).

"(Difference in weight of one gramme or less is considered equal.)

	Ages.	Number of Cases.	Left Brain greater than Right Brain.	Right Brain greater than Left Brain.	Left and Right equal.
Males	10—87	157	49	51	57
Females . . .	10—87	144	43	46	55"

Professor Cunningham also stated in his recent lecture at the Anthropological Institute, that after many long years of most careful examination he had not succeeded in discovering any superiority whatever in the left lobe, and, in a letter to the writer, dated October 29th, 1902, he says :—" I have failed to detect any structural condition in the left cerebral hemisphere to account for its functional pre-eminence—in so far as speech and right-handedness are concerned. From the weight and convolutionary points of view, I should say that if any difference exists between the two hemispheres, IT IS IN FAVOUR OF THE RIGHT," and his language is very strong as to the convolutions, for he says, " I am satisfied that no amount of ingenuity would enable us to twist the asymmetrical arrangement of the convolutions into such a form as to give a constant and general superiority to one hemisphere over the other." (Lecture, p. 17.)

The capitals are ours. Now, if Drs. Donaldson, Braune, Franchesci, Thurnam, and Cunningham are right, what becomes of the whole of Dr. Cahall's five notable propositions ?

Certainly the evidence is contradictory, flatly so, and we have on the one side a trio of authorities dogmatically asserting a structural superiority in the left lobe of right-handed persons, with a similar and unmistakable

superiority of the right lobe in left-handed persons; whilst on the other side we have an equally distinguished, reliable, and still more recent quartette of specialists, who positively declare that there is no such organic pre-eminence; the propounders of the theory give the results of examination of 200 brains, whilst the opposing investigators tabulate the figures of 392 brains of both sexes. Surely the most biassed jury in such a case of conflicting testimony could only return a verdict of "Not Proven."

But there is another view to take of this theory of Dr. Cahall's; for evidently the argument would be incomplete were no reference made to the brain condition of strongly left-handed persons, and also of those in whom there is found a reversal of normal "Aorta Arches" arrangement; and therefore Dr. Cahall goes on to inform us that in a certain proportion of subjects the aorta arches from left to right—i.e. in the contrary direction—in which case the innominate artery is on the left side, and this arrangement would consequently favour the superior growth of the right hemisphere of the brain and would predispose to the use of the left hand.

Dr. Barclay and others accept Dr. Cahall's hypothesis, although they have to acknowledge that the reversal of the arching of the aorta does not, **even very frequently**, produce this superiority in the right hemisphere and its resultant left-handedness, which are naturally looked for in such cases. The difficulty is recognized, and the ingenious writer endeavours to get rid of it in the following way:—

"Unfortunately there have been no post-mortem examinations made for the purpose of examining whether this reverse arrangement of bloodvessels and the use of the left hand really do occur in the same individual, **nor is it necessary that it should be found in every case,** for there are other anomalies in vessel-branching which would favour the growth of the right hemisphere."

Alas for the Doctor, who would seem to have got a little mixed in this winding up of the argument. The ambiguity of his inference stultifies his own premises; and Sir Charles Bell, M.D., considers (with reference to the entire supposition) that "this, however, is assigning a cause altogether unequal to the effect, and presenting too confined a view of the subject. It partakes of the common error of seeking in the mechanism, the explanation of phenomena which have a deeper origin.

If the hypothesis has not been demonstrated by a sufficiency of observations and experiments proving that the greater lobe of the brain invariably determines the dexter hand—be it right or left—the theory must remain in the region of unproved speculations.

That there is a subtle connection and a vital one between the conformation of the brain lobes and one-handedness appears to be indisputable, but the nature of that connection remains to be discovered and defined.

On this point we have some valuable remarks from Sir W. R. Gowers, who informs us that there are four speech centres or regions, viz.:—1. for the motion of speech; 2. for the motion of writing; 3. for the perception of words; and 4. for the perception of seen (or visible) words. Of these, two transcend the others in primary importance and influence,—namely, those for hearing and utterance. "The relation of the processes for language to the left side of the brain is unquestionably connected with right-handedness, since persons who are left-handed present the same defects of speech in disease of the right hemisphere of the brain as right-handed persons do in the disease of the left. **They are right-brained.** A related fact is also important for those concerned in education. In children, destruction of the left motor speech centre never causes lasting loss of speech, as it does in adults. However complete the loss may be at first, speech is regained, and before long it is difficult to detect any imperfection. There

must therefore be a capacity for the acquisition of voluntary speech processes on the right side in the young which there is not in the adult. These facts show that the exclusive relation of voluntary speech to the left brain is due to the disuse for speech of the right brain; that this disuse varies in its degree in different persons; that it seems to occur in the transition from childhood to youth, and that it is related to the use of the right hand."

To conclude the pronouncements concerning this theory of Brain One-sidedness, we have to present the reader with the very interesting and unique experiments of Professor J. Mark Baldwin, who gives the details of the tests with his five months old baby; the experiments extended from the fifth to the ninth month in her life. There is no evidence forthcoming as to whether the infant was in charge of a nurse, and if so, whether any precautions were taken to prevent any bias being imparted by direct influence or otherwise upon it during the intervals between the experiments. However, we shall return to this part of the subject later on.

1890.	No. of Series.	No. of Tests.	Right Hand.	Left Hand.	Both Hands.
February 10th to March 14th	30	744	173	166	405
March 14th to April 14th .	25	623	134	141	348
April 14th to May 14th . .	25	546	213	130	203
May 14th to June 10th . .	16	274	57	131	86
	96	2,187	577	568	1,042

The above tests consisted in offering the infant some desirable object, toy or other, holding the same within easy reach of—and about equidistant from—each hand. Mr. Baldwin observes that there is evidently no preference shown in these results for either hand, hence, he varied the experiment so as to cause or necessitate a "longer reach" involving somewhat "hard straining" and greater muscular effort. These modified tests extended from

May 26th to June 10th, about a fortnight, and the outcome was a considerable alteration in the figures.

1890.	No. of Series.	No. of Tests.	Right Hand.	Left Hand.	Both Hands.
May 26th to June 10th .	32	80	74	5	1

The sudden and marked preferential use of the right hand continued when the conditions of test were prolonged and varied as to colour, stimulus, &c., and the general conclusions arising from the entire course may be stated as follows:—

Results.

"1. No preference was shown for either hand so long as there was no violent muscular exertion demanded.

"2. The tendency under the same conditions to use both hands simultaneously was about double the tendency to use either.

"3. A distinct preference for the right hand in all violent efforts was exhibited in the seventh and eighth months; right-handedness, in fact, had developed under pressure of muscular effort in the sixth and seventh months.

"4. Up to this time the child had not learned to stand or to creep, therefore the right-handedness could not have been due to the unequal weight of the viscera on either side of the body. As she had not learned to speak or to utter articulate sounds with much distinctness, we may also say that right or left-handedness may develop while the motor speech centre is not yet functioning.

"5. In most cases involving a marked use of the one hand in preference to the other, the second or backward hand followed slowly upon the lead of the first in a way clearly showing symmetrical innovation of accompanying movements by the second hand."

The conclusions of Professor Baldwin run as follow:—"It is likely, therefore, that right-handedness in the child is due to difference in the hemisphere of the brain reached

at an early stage of life; that the promise of it is inherited; and that the influences of infancy have little effect upon it. Yet, of course, regular habits of disuse or of the cultivation of the other hand may, as the child grows up, diminish or destroy the disparity between the two hands. And this inherited brain one-sidedness also accounts for the association of right-handedness and speech —the speech function being a further development of the same unilateral potency for movement found first in right or left-handedness."

We think the conclusions of Professor Baldwin premature, and in one or two points inaccurate. If his experiments are awarded their full value, they prove little or nothing for or against the theory now under consideration, for no reliable or general deduction, such as Professor Baldwin offers, can logically be drawn from the phenomena of a single individual case. Nor can it be granted for a moment that his daughter was typical of the normal child. Its early, pronounced—and shall we say unconscious?—right-handed preference clearly marks it out as one of the strongly and naturally biassed individuals forming the 20 per cent. of lopsided beings who, **all through life**, and in spite of all pressure, punishment, education, or custom, maintain unimpaired a one-handed pre-eminence.

Of course, as Dr. Ferrier aptly observes in his "The Functions of the Brain" (1886):—"The speech centre is, as has been stated, in the great majority of instances situated in the left hemisphere. But there is no reason why, beyond education and heredity, this should necessarily be so (why dextral pre-eminence should occur in the first instance is not quite satisfactorily made out). It is quite conceivable that the articulating centres of the right hemisphere should be educated in a similar manner. A person who has lost the use of his right hand may, by education and practice, acquire with his left all the cunning of his right. In such a case the manual motor

centres of the right hemisphere become the centres of motor acquisitions similar to those of the left. As regards the articulating centres, the rule seems to be that they are educated and become the organic seat of volitional acquisitions on the same side as the manual centres. Hence, as most people are right-handed, the education of the centres of volitional movements takes place in the left hemisphere. This is borne out in a striking manner by the occurrence of cases of aphasia with left hemiplegia in left-handed people. Several cases of this kind have now been put on record."

And Dr. H. H. Donaldson follows on the same lines when he says (p. 275, "The Growth of the Brain"):—"It is probable, from all that can be ascertained, that in a thoroughly Ambidextral individual the two hemispheres more nearly correspond in their functions than they do in the one-handed individuals as represented by the majority of the community. It is certain, however, that while, in the strongly right-handed persons, it is the left hemisphere which is mainly concerned, the reverse is the case in those left-handed. . . . Though in children injury to one hemisphere may be compensated by the development of the other, in the adult such is not the case."

This necessarily refers to speech centres exclusively. And so, whilst it is an actual fact that the two brains may thus independently perform their functions equally and separately, we have not yet seen or heard of a case where the sinister hand has ever attained to the dexterity of its dexter fellow in any individual where the preferential natural bias for either hand was strongly exhibited during infancy and childhood.

Whatever, therefore, may be the connection between the hand and the brain, it must not be forgotten that the left-headedness, on which we are told this right-handedness depends, may just as easily be an EFFECT of the right-hand predominance as its CAUSE! and if so, the innumerable generations of right-handed people will ration-

ally explain its appearance, even in the youngest, and prior to any direct effect of right-handed practice upon the left lobe—as in the case of the Professor's infant daughter aforesaid. Granting that the left brain drives the right hand, and that the right brain controls and guides the left hand, it will be at once admitted that the more the right or the left hand is exercised, practised, and used, just so much more will the motor cells of the controlling side of the brain be stimulated, strengthened, and developed. This presumption is in accord with the teaching of almost every authority who has written on brain culture or growth.

Hence, and lastly, until, as with the first hen and the first egg, doctors can satisfactorily determine which is the primal cause, i.e. whether left-brainedness originally produced right-handedness, or whether right-handedness has developed left-brainedness; this theory, propounded by Dr. Cahall, cannot command our acceptance or approval.

12. The Result of Natural Selection.

Professor D. J. Cunningham, M.D., D.C.L., F.R.S., who expounded his views on "Right-handedness and Left-brainedness," the result of Natural Selection, before the members of the Anthropological Institute on October 21st, 1902, is the champion of the most recent hypothesis on this subject. Dr. Cunningham being the Huxley Memorial Lecturer for the year, his pronouncements are invested with special interest and importance, which demand, consequently, special examination and careful consideration.

The lecture covers a wide area, and it is to be regretted that in the present case the whole of the field cannot be explored. Little, however, if anything, will be omitted that is germane to the purpose of this chapter, and whatever may not be included is therefore foreign to the present inquiry.

What, then, are the main propositions relied upon, and sought to be established, in the elaboration of this "Natural Selection" theory? They are as follow, and we append to the list one or two of the Professor's conclusions, so that in a synoptical form the reader may survey the entire extent of the argument, together with the result of those profound investigations and observations upon which it is founded.

Synopsis of Professor Cunningham's Argument.

1. **Our ancestors the monkeys were truly Ambidextrous:**—"I have never been able to satisfy myself that they show any decided preference for the use of one arm more than the other" (p. 13).

2. **Primitive man, whilst going on all fours, was also truly Ambidextrous:**—"In the evolution of man right-handedness did not assert itself until the upper limb had been set absolutely free from the office of locomotion" (p. 14).

3. **Immediately man began to walk on two feet right-handedness asserted itself:**—"No sooner did man assume an upright gait than this character began to be developed" (p. 14).

4. **Right-handedness is produced solely by Hand culture:**—"This character began to be developed—feebly marked in the earlier stages, no doubt, but gradually gathering strength as the connection between the hand and the brain became more and more intimate, and as the work allotted to the hand grew in importance" (p. 14).

5. **Right-handedness is a character or faculty inherited by us through Natural Selection:**—"Right-handedness is a character which has been attained in the ordinary course of the evolution of man by the subtle process of 'Natural Selection'" (p. 12).

6. **Right-handedness is caused by Left-brained-**

ness:—" Right-handedness is due to a transmitted functional pre-eminence of the left brain " (p. 13).

7. **Left-brainedness is a production of "Natural Selection"**:—" Left-brainedness, or the functional pre-eminence of the left brain, is not the result, but through evolution it has become the cause of right-handedness " (p. 15).

8. **This Left-brainedness consists in a structural foundation or difference, and is hereditary**:—" The superiority of the left cerebral hemisphere rests upon some structural foundation which is transmitted from parent to offspring " (p. 15).

9. **No structural condition, as to weight or convolutions, accounting for this left-brainedness, has hitherto been detected**:—" We may dismiss therefore from our minds the possibility of left-brainedness being due to **a greater mass** of cerebral substance on the left side of the brain. . . . I am satisfied that no amount of ingenuity would enable us to twist **the asymmetrical arrangement of the convolutions** into such a form as to give a constant and general superiority to one hemisphere over the other " (p. 17).

10. " That I should have so far been baffled in the attempt to discover some structural character to account for the functional superiority of the left cerebrum **does not lessen my belief that such exists.** It merely persuades me that the inquiry has been conducted up to the present along wrong lines, and I do not doubt that the problem will ultimately be satisfactorily explained " (p. 21).

11. " It is not alone in the possession of **the awkward hand** that the left side **shows inferiority** (!) It would seem that in some respects it exhibits a less vigorous growth, and that in certain localities it is more prone to congenital defects than the right side."

Dealing with these items in the order here given, the first three may be approved and passed, whether we

accept the teaching about our anthropoid ancestry or not. With reference to No. 4, the complete paragraph runs as follows:—"No sooner did man assume an upright gait, than this character (of right-handedness) began to be developed—feebly marked in the earlier stages, no doubt, but gradually gathering strength as the connection between the hand and the brain became more and more intimate, and as the work allotted to the hand grew in importance. It thus comes about that it is in civilized races engaged in skilled labour of the highest order that the highest degree of right-handedness is exhibited, and it becomes a question whether the introduction of mechanical contrivances, which are nowadays so fast replacing manual work—the typewriter and the printing-machine, the steam-loom and the reaping-machine—may not in the course of time operate to some extent in the opposite direction" (Lecture, p. 14).

Two or three queries immediately present themselves to the reader's mind in connection with this first batch of terms.

First: Why should the quality or attribute of right-handedness have remained dormant until the hands "had been set absolutely free from the office of locomotion"? and what stimulus was, or could have been afforded for its development by the work of the hands being thus so materially diminished as it was when they stopped walking? The right side visceral preponderance existed then, when man was a four-footed or four-handed animal, even as now; and also the other potencies which have, according to modern theorists, so great an influence in developing this right-hand supremacy. Where, then, was the exciting cause of such a lopsided pre-eminence during all those ages of Ambidextral existence? Can we conceive the duties of the hands to assume a more intelligent or intellectual character simply because the monkey, or the man, may be walking on two legs (or feet) instead of four? What extra and higher order of

duties or functions, e.g. would the hands of **the first upright man** be called upon to discharge that his four-footed parents were not daily and continually performing?

Secondly: If a "higher order of work" required, as it undoubtedly must have done, a "higher order" of intelligence to execute it, what induced the increased or superior intelligence in the first case? Which of these two "higher orders" came first into existence, the "work" or the "intelligence"? And in either case, why?

Thirdly: In what way did, or could, "the connection between the hand and the brain" become more and more **intimate** in those early stages of man's separate history? Does this "intimacy" consist in the celerity or instantaneousness in transmission of the volitions from the brain to the hand, or in the responsiveness or sensibility of the hand in obeying the behests of its master? Is the connection, for example, between the brain and the paw, or hand, of a monkey in its cage, less intimate, less instantaneous, or less perfect than that between the brain and hand of its keeper? Does the connection ever fail in one case and not in the other? Are the hands of the ape less under control—in the limit of its evolutions and requirements—than are the hands of a man? If so, how does such inferiority show itself? for the hands of a monkey are not by any means confined to the offices of locomotion, "but are endowed with many of the capabilities which distinguish the human hand" (Lecture, p. 13). So far as general observation goes, it would probably be unanimously granted that the connection between the hands and the brain of the monkey is of a very superior nature, if unerring calculations of distances, unfailing powers of grip, and lightning-like movements are any indication that the "lines of communication" are maintained without interruption or delay!

Taking the entire quotation, it is asserted that hand-culture develops right-handedness, and that deterioration in hand-culture promotes a reversion to the original type of true Ambidexterity. And by hand-culture is meant the employment of the hands in occupations and functions of the higher, and the highest, order—skilled labour, in which superior intelligence and delicacy of manipulation are demanded. The dogma then is clearly defined; the more the two hands are exercised in this "highest order" of work the more—and to precisely the same degree—will right-handedness increase, and the contrast between the two hands in their dexterity and sensibility exhibit itself. And so vitally are these two things associated together, that the right-handedness depends for its very existence and survival upon the circumstance and the continuance of this "highest order" of hand-culture!

There will be good reason for returning to this anon.

Section 5 contains the enunciation of Professor Cunningham's theory. It is the subtle process of "natural selection" which is answerable for right-handedness, but in order to effectually discuss the whole question the next three paragraphs must be included. We will give the hypothesis in the author's own words as fully as is necessary.

"Right-handedness is a character which has been attained in the ordinary course of the evolution of man by the subtle process of natural selection (p. 12). All the evidence at our disposal goes to show that right-handedness is due to a transmitted functional pre-eminence of the left brain (p. 13). There cannot be a doubt that the superiority of the left cerebral hemisphere rests upon some structural foundation which is transmitted from parent to offspring (p. 15). The functional pre-eminence of the left brain is not a haphazard acquisition which has been picked up during the life of the individual. It is not the result, but through evolution

it has become the cause of right-handedness. . . . The most favourably placed limb has been raised by natural selection to the position of special importance by the perpetuation of a variation in the cerebral hemisphere which presides over its operations" (p. 15).

The only rational interpretation that can be put upon all these premises, so far, is that "natural selection" has developed a left-brainedness which, in its turn, has produced a right-handedness; and that this left-brainedness has produced the right-handedness by giving the hands a "higher order" of work to do; and that when this "higher order" of work is diminished or withdrawn, the right-handedness is similarly diminished or destroyed. Furthermore, this right-handedness is strictly hereditary, since its cause, the left-brainedness, rests upon a "structural foundation which is transmitted from parent to offspring."

"Natural selection" has, then, much to answer for. Its mode of working is defined by its great author, who says: "Natural selection acts only by taking advantage of slight successive variations; she (?) can never take a great and sudden leap." "As natural selection acts solely by accumulating slight successive variations, it can produce no great sudden modifications. It can act only by short and slow steps" (Darwin, "Origin of Species," pp. 156, 413). "Natural selection acts exclusively by the preservation and accumulation of variations which are beneficial." "Natural selection acts only by the preservation and accumulation of small **inherited** modifications, each profitable to the preserved being." "On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. THIS PRESERVATION OF FAVOURABLE INDIVIDUAL DIFFERENCES AND VARIATIONS, AND THE DESTRUCTION OF THOSE WHICH ARE INJURIOUS, I HAVE CALLED NATURAL SELECTION, OR SURVIVAL OF THE FITTEST" (Darwin, "Origin of Species," pp. 63, 75, 97).

Herbert Spencer, also one of the recognized authorities among evolutionists, tells us that: "From the remotest past which science can fathom, up to the novelties of yesterday, an essential trait of evolution has been the transformation of the homogeneous into the heterogeneous. . . . At the same time that evolution is a change from the homogeneous to the heterogeneous, it is a change from the indefinite to the definite. Along with an advancement from simplicity to complexity there is an advance from confusion to order. . . . Development, no matter of what kind, exhibits not only a multiplication of unlike parts, but an increase in the distinctness with which those parts are marked off from one another" ("First Principles," pp. 359, 362).

And, lastly, "natural selection" acts exclusively through "THE PRESERVATION OF PROFITABLE MODIFICATIONS OF STRUCTURE" (Darwin, "Origin of Species," p. 90).

Now, and generally, since monkeys and men were admittedly true ambidexters originally, it must be clearly shown how, in their wild and savage state, slight modifications of, and variations in, right and left brainedness, and the appearance of a dextral superiority, with a corresponding deterioration of the sinistral front or upper limb, could possibly be "favourable," "beneficial," or "profitable" to those animals so affected. It seems obvious and irresistible that, whether apes or human beings, they must equally suffer through what cannot but be considered as a serious defect; for the animals so situated would certainly suffer in their powers of locomotion, arboreal or terrestrial, and would be still more disadvantaged in their offensive and defensive endowments and capabilities by the possession of an inferior and partially crippled limb. Captain Edgeworth-Johnstone, Superintendent, Gymnasia, Dublin, writes under date February 5th, 1903: "On one occasion at the Royal Military Tournament I met in competition an officer who fenced equally well with either

hand—in fact, he frequently changed hands in the middle of a bout. The fact that he worked his way well up in the competition **was solely due to this accomplishment,** as he was by no means in the first flight as a '*sabreur*.' . . . There are few sports or athletic exercises where the advantages (of two-handed ability) are not **most apparent.**" If, therefore, in modern warfare and physical exercises ambidextral skill confers such undoubted advantages on the truly two-handed individual—and every living ambidexter testifies to this fact—how impossible is it for us to conceive where and how in primitive times its virtue was lost in these **predominant,** almost exclusively pre-eminent, departments. The dilemma is an awkward one for the exponent of the natural selection hypothesis; but the facts are inexorable, and must be met and disproved if the theory is to survive even with a modicum of probability in its favour. And it is futile to point out the great advance which man has made in his unidextrous condition, because of the reply that in an ambidextrous condition he might just as easily have made a still greater improvement; and the natural contention is that he would. Hundreds, if not thousands, of cases and testimonies could be adduced wherein the "fittest" is the ambidexter and not the unidexter; where the "profitable" and "beneficial" variation is in the truly two-handed, and **not** in the dextral or lopsided workman (be he surgeon, pianist, cricketer, artizan, athlete, clerk, carpenter, or navvy); and again it may be urged how inconceivable is it to imagine that the possession of a sinistral semi-abortive limb by pre-historic man—**or monkey!**—could be considered such an advantage, by "natural selection," as to be transmitted down from parent to offspring through all those countless generations in his primeval existence.

If then, and it would seem to be irrevocably so, the differentiation of the two brains and the two hands was a positive disadvantage in those early times, "natural

selection" would unquestionably have not only declined to perpetuate it, but the "survival of the fittest" would have "rigidly destroyed" every specimen of it; for "natural selection," according to its advocates, is not less rigorous and exact in the extermination of unfavourable variations than it is in the preservation of those modifications which are beneficial. Mr. Darwin assures us that any variation **in the least degree injurious** would be thus **rigidly destroyed.** The onus of proof that unidexterity is and was an "advantage" rests with the lecturer; but, with the evidence before us, such "advantage" has not been established.

Going still further back, we might challenge Dr. Cunningham to demonstrate the advantage pertaining to the intermediate being, half monkey and half man, that went partly on two feet and partly on four? Are we to believe that all those innumerable intermediate "aberrations" (or links) who could neither fight nor climb, nor travel so well as their progenitors, possessed other compensating advantages arising out of their inferior left hands that gave them a resistless supremacy in the struggle for existence? If this be so, it would be well, and necessary, to define them.

Leaving the right-handedness to be adjusted and located in the list of human improvements, or otherwise, when these difficulties are met and disposed of, the subject of **left-brainedness** claims our attention. We are told that this "functional pre-eminence of the left brain rests upon some structural foundation which is transmitted, &c." (Lecture, p. 15).

This **structural foundation** may exist, so medical men assert, in either superior weight, mass, convolution, or cortical area; and such superiority has been said to exist in the left brain. That both the functional pre-eminence and the structural foundation are at present purely hypothetical will clearly appear from the lecturer's own words and the evidence of numerous specialists in anatomical and medical science to be produced.

"Braune has shown in the most conclusive manner that if there is any difference in weight between the two hemispheres, it is a difference in favour of the right, and not of the left; and I may add that these results are quite in accord with my own observations, and that I believe that the same conditions as to weight are present at all periods of growth and development. We may dismiss, therefore, from our minds the possibility of left-brainedness being due to a greater mass of cerebral substance on the left side of the brain" (Lecture, p. 17).

"I am satisfied that no amount of ingenuity would enable us to twist the asymmetrical arrangement of the convolutions into such a form as to give a constant and general superiority to one hemisphere over the other" (Lecture, p. 17).

"A comparison of the human brain with that of the three higher anthropoids shows that, in so far as the cortex exposed on the surface is concerned, there is little difference in the relative extent of the arm area. If there is any difference it is one in favour of the anthropoid" (Journal, p. 292, and note).

"No constant or definite difference can be detected in the area of cortex associated with the speech centre on the two sides of the brain, and yet it would appear that only the left speech centre is active. The results, therefore, which have been derived from our examination of the arm-area of cortex on the two sides ARE OF A PRECISELY ANALOGOUS NATURE" (Lecture, p. 22).

"That I should have so far been baffled in the attempt to discover some structural character to account for the functional superiority of the left cerebrum does not lessen my belief that such exists. It merely persuades me that the inquiry has been conducted up to the present along wrong lines, and I do not doubt that the problem will ultimately be satisfactorily explained" (Lecture, p. 21).

Hence, until some fresh light is thrown upon this inexplicable phenomenon, the theory may be relegated to

the region of unproved speculations ; more especially when this so-called "functional **pre-eminence**" is shown to have no foundation whatever in fact, and that this most impressive phrase means nothing more than functional **activity** arising from a functional culture that necessarily caused it, or called it into being.

Drs. Donaldson, Ferrier, Bastian, and Wigan—four sufficiently good names surely—agree in asserting that both in regard to speech and motor capabilities the right brain is no whit inferior to the left, but that it **has been, can, and may be** cultivated or educated to exactly the same degree of activity or functional ability as its fellow, the left brain. The actual cases that have occurred where, as regards speech, motion, and reason, such equality has been proved, are on well-authenticated record, and cannot be questioned. If, consequently, the right lobe can be so developed as an unexceptionable "understudy" (and even a permanent substitute) for the "principal" or left lobe—so much so indeed as to be actually mistaken for it—where does the inferiority exist ?

A brief reference to the Professor's concluding depreciatory remarks on the "left side" must be made before closing.

The designation "the awkward hand" is very unkind and quite as unmerited. In spite of ages of neglect and repression, does not this sinistral member acquit itself with marvellous efficiency ? Even with right-handed persons, does not the left hand almost rival its fellow on the key-board ; bat and bowl as well in the cricket-field ; fence, row, hammer, draw, write, and perform a thousand other offices as deftly as the right ? Is it not doubly unkind first of all to condemn the left hand to a life of practical inaction, to systematically neglect its education, to deliberately deprive it of the opportunity of developing, and then loudly to upbraid it for its inefficiency ?

Ignorance, prejudice, custom, and even education, have done their best to dishonour and injure it, but—and this

is matter for devout thankfulness—it is just as ready and just as capable to respond to an equitable adjustment and apportionment of culture as its *confrère* the right hand.

The congenital and other defects referred to are not inherent in or inseparable from the left side; they are the natural effects of a known cause, the inevitable results of a mistaken treatment, the legitimate development of a "human (we had almost said inhuman) but not the less **un**natural selection."

Considering, then, that Dr. Cunningham confesses that he has failed to discover ANY physiological or anatomical difference in the structure of the two brains to account for the universality of left-brainedness; that innumerable instances are on record in which the right brain has taken up and discharged with undiminished vigour and competency all the functions and duties previously executed by the left; and that the left hand, in every normal individual, always has and does exhibit similar and equal sensibility, dexterity, accuracy, and strength when subjected to the same kind and degree of education or culture, may we not conclude with safety and assurance that whatever else "natural selection" may have done in the remote ages of the past or in more recent times, it certainly cannot be held responsible for that "one-handedness" which seems nevertheless to be a common heritage of mankind?

We have now discussed briefly and very imperfectly the various hypotheses which have been advanced to account for right-handedness, and we are bold enough to dissent from them all. We recognize the authority of the writers, we admit their high qualifications, their research, and their unimpeachable sincerity, but we withhold our assent from each and every one alike, believing as we do that they have all missed the very crux of the entire question, viz. that the one-handedness is an ABNORMAL and not a NATURAL phenomenon.

What therefore appears to be the most rational solution

of this very vexed and complicated question (after reviewing all the evidence adduced in support of the preceding theories) is to start with the assumption that not only was perfect ambidextral function or two-handed skill the characteristic of primeval man, but that it is and was intended to be by the Creator the rightful heritage of mankind; that the 80 per cent. of either-handed (and truly two-handed) children born into the world constitute the normal type of man—which normal type is amenable to the most absolute Ambidexterity; and that the 17 per cent. of strongly biassed right-handed births together with the 3 per cent. of left-handed births are deviations from the parent stock or normal type—irregularities or freaks of nature—just as mysterious and unexplainable as are other abnormalities that are occurring all round us in precisely similar or approximate degrees of frequency, and in exactly the same quasi-hereditary, irregular, or sporadic manner.

This view, it is believed, is supported by parity of reasoning with regard to the two eyes, the two ears, and the two feet. We do not take the victims of strabismus, talipes, and suchlike afflictions as normal types of eyesight and pedestrian powers. Why, then, do so in the case of a similarly small proportion affected and afflicted with the disease of congenital one-handedness?—for it must not be lost sight of, that the 80 per cent. are congenitally two-handed.

Our theory, then, is as follows:—We believe that the 80 per cent. of normally TWO-handed persons are made ONE-handed SOLELY by the pressure of early influences and training, in which nurses, mothers, teachers, and an uncompromising prejudice, unite their misdirected forces with a determination and persistency that Mrs. Grundy herself has never approached; and hence that our national education is little better than a crippling of the child's faculties and a serious diminution of the nation's efficiency.

For in the case of the 3 per cent. of left-handed victims, their natural powers are suppressed, injured and

partially destroyed; the 17 per cent. of strongly right-handed people have their dextral powers abnormally developed and their sinistral potentialities utterly neglected; whilst the 80 per cent. of normal two-handed individuals have their right hands trained to what never exceeds a mediocre standard of dexterity, their left hands being considered quite undeserving of the slightest attention or cultivation.

Given a complete and universal scheme of Ambidextral Culture, and we should undoubtedly obtain a community that would be perfectly two-handed; wherein over 20 per cent. would be conscious of any difference whatever in the skill and delicacy of their two hands, the remaining 80 per cent. being as bimanous in practice as they were in conformation.

The explanation of one-handedness now offered receives further confirmation from analogy or comparison with the animal world, throughout which it has been shown the most perfect two-sidedness or bilateral equality obtains. Its members, from the quadrumana down to the rodentia and crustacea, walk equally with both feet, legs or claws, grasp equally with both hands, fly equally with both wings, climb equally with both or all four paws and claws, perch or roost equally on either foot, and lie equally on either side.

Man's lopsidedness (born of a "wickedness" for which he was never designed, so we are told) is the only exception to the "universal symmetrical balance of power and perfect bilateral co-ordination" that elsewhere and everywhere prevail.

One-handedness then, we take it, whether it be dextral or sinistral, is a departure from the normal type and from the natural two-handedness of the 80 per cent., the great bulk, of mankind; a deviation which must be ranked in the same class or category as other irregularities and abnormalities that follow almost exactly the same laws of generation and development.

CHAPTER IV

DISADVANTAGES OF ONE-HANDEDNESS

That serious disabilities, defects, and disadvantages attend our present one-handedness, interfering very materially with manual efficiency in almost every department of life, will be generally admitted by any person who takes even a cursory view of the situation. And these disadvantages are as numerous as they are grave. Indeed, the left hand has been so woefully neglected and ignored for generations and ages, that, although it will respond in time most effectively and perfectly to every demand made upon its powers, **yet spontaneously** it is unable, except with the greatest awkwardness, if not clumsiness, to do the smallest act of a novel or strange character and to which it is quite unaccustomed. Hence it is found that in all occupations, whether of a recreative, or business, or personal nature, the left hand is practically useless unless subjected previously to a systematic training, as in piano-playing, billiards, cricket, surgical operations, writing, drawing, and a large majority of handicrafts.

In the domain of sports, games, and recreations, the one-handed man is lamentably deficient and inferior. The fieldsman who can neither catch, throw in, nor bowl with his left hand is almost debarred from first-class cricket, and, indeed, the really one-handed man is nowhere, and can never become a Darling, a Daft, a Grace, or a Gunn in the field, a Roberts at the billiard table, or an Izaak Walton by the riverside. Then in

gymnastics or acrobatic performances a large proportion of the exercises is either dangerous, difficult, or impossible to the athlete (?) whose left hand has not been duly and truly trained to a very high degree of dexterity.

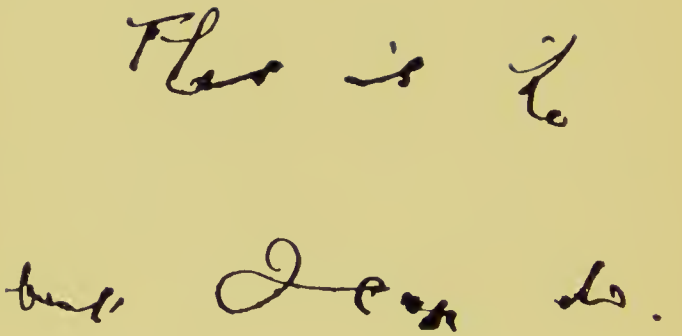
In the department of home life there are a thousand-and-one details of domestic work that would render it intolerable drudgery to the one-handed housewife, to the woman who was incapable of using her sinistral hand with considerable facility and skill. Very frequently, as we shall see presently, one-handedness causes annoyance, inconvenience, and loss to an alarming extent.

There are several hundreds of trades and manual occupations which suffer materially from the inefficiency of one-handed or right-handed persons—e.g. in carpentry, glazing, bricklaying, stone-cutting, digging, &c., &c.

The professions afford still more pronounced cases of one-handed helplessness. Where do the one-handed pianists, harpists, organists, or surgeons appear in the list of celebrities? The idea is absurd, the assumption unthinkable. In the last-named profession the inconvenience of one-handedness is such a fatal barrier to success that a certain amount of manual training for the left hand has to be gone through in order to qualify the surgeon to perform particular operations (impossible to the right hand) thus entailing a great deal of laborious and tedious effort, often for long periods.

Another serious aspect of the question is met with on the occasion of accident to, or loss of, the dexter hand. As Dr. Lundie remarks:—"Let a right-handed person be obliged by an accident to use his left hand for all purposes, and he will be inclined the more to think it is well called 'sinister,' so slow and helpless will he find it in doing his bidding, so unreliable and deceptive."

The malady which most often and seriously attacks and cripples the right hand is "writer's cramp," but there are numerous counterparts in pianist's cramp, and the



Specimen of writing by one suffering from writer's cramp.
Age of writer about forty.

Fig. 1.

various forms of paralysis peculiar to smiths, bricklayers, masons, carpet-sewers, &c.

Writer's cramp is the most common of these functional impotencies, but the others occur with a frequency that is only known to medical men and those connected with the industries which produce those diseases.

There are somewhat unusual features in this affection of writer's cramp. Whether there is or is not a controlling centre for the act of writing (as many neurologists maintain there is), it is perfectly clear that the co-ordination of writing, or of any educated movement, may be upset by a peripheral lesion causing an uncertainty in the response of the muscles to the mental stimulus. The fact that the left hand (if used for writing, by a sufferer from writer's cramp) is liable to be affected in the same way as the right hand, has been used, especially by Duchesne, as an argument in favour of the disease—and consequently the right-handedness—being due to a central lesion. But, on the other hand, the fact that writer's cramp is always of more or less gradual growth, and is **never suddenly** established, militates strongly against the idea of a controlling centre, which, whether congenital or acquired by education, would surely be liable to occasional accident and sudden extinction, just as the centre of language is sometimes extinguished.

Dr. G. V. Poore gives the details of 168 cases in vols. 61 and 70 of the "Medico-Chirurgical Transactions," the cases extending, as he tells us, over a period of sixteen years. Now it is a matter of common knowledge not only that thousands of people suffer and are stricken down by this class of disease—many brilliant pianists being utterly ruined by its attacks—but that it almost invariably results from this one-handedness that exists amongst us—i.e. that the disease is the **direct** effect of too great a strain upon one—the dexter—hand. No. 75 in Dr. Poore's list illustrates this, where the patient was congenitally left-handed; but as he was very

dextrous with the right hand also, the abnormality did not require treatment, and the ailment was due to an accident.

It is remarkably significant that in all these 168 cases of Dr. Poore only three are left-handed (Nos. 75, 87, and 88); the first, No. 75, who wrote as quickly with his left hand as others do with their right, and more quickly than he himself could with his right, required no medical treatment whatever; whilst the other two wrote with their right hands. No. 87 had to give up his occupation because of the writing difficulty, and No. 88 suffered from cramp in his right arm. So that **not one** of the entire number suffered from left-handed cramp, and not one of the patients was an Ambidexter! The disadvantages of one-handedness might be indefinitely extended to nearly every occupation in life where the one hand is exercised; for whether in writing, drawing, painting, or typewriting; whether in culinary, carpentry, or cookery occupations, in engineering, architecture, or surgery,—ONE-HANDEDNESS is alike irksome, awkward, inferior, and sadly disadvantageous.

Considering, then, the great frequency of accident to and disease in one hand, we should be more than warranted in strongly urging the adoption of Ambidexterity; but when, in addition, we find so much inferiority and loss from a non-cultivation of the second hand and from the absence of an equal dexterity therein, does not the continued neglect of the sinistral member become more than a reproach or even a disgrace—a genuine misfortune? Dr. A. Buchanan tells us that:—"In childhood the two hands are often used indiscriminately. This is more especially the case with weakly children, with whom it requires great attention to make them relinquish the bad habit of using the left hand, which it is supposed they have contracted. But this is a mistake, and an error in physiological training founded upon it. **Nature intends all the limbs to be equally exercised** and it is wisest to allow the

development of all parts of the frame to proceed in the natural way without interference. It is to do violence to nature and to dwarf the left side of the body to enforce upon a child the use of the right hand."

Dr. W. C. Cahall argues on the same lines but from a different basis when he says:—"Now if the reason of our choice of a hand is due to an organic cause, how unwise it is to fight against nature unless we commence at the beginning and trust that habit will overcome the predisposition to use the left hand. Undertaken later, the result is often to spoil the skill of the left hand without training the right to do its work as well."

This qualified and cautious declaration of the Doctor's may be safely expanded to its utmost limit, for **common experience** and daily testimony prove to us that left-handedness is NEVER eradicated, and that the inevitable result of all modern education with left-handed pupils is to cripple both hands instead of developing and perfecting either.

Dr. Hollis has some very weighty words to say on this matter of our defective and one-sided system of training which has proved so detrimental to the highest interests of the nation and race—injurious both indirectly and directly. His trenchant criticism should be read by every sincere well-wisher of his fellows. He fearlessly and, we believe, equally truthfully asserts:—"That many worthy lives have fallen a sacrifice to this 'Moloch' of education is undoubtedly true." He mentions Dr. Samuel Johnson, Dean Swift, and the eminent German scholar, Spalding, as some of those who have suffered. "In the days of our forefathers, when work was not performed at the present high-pressure speed, and the struggle for existence was proportionately less, the dextral flaw in our education was of little or no importance; now, however, the time has arrived when our posterity **must utilize to the utmost every cubical line of brain substance, and this can only be done by a system of education which will enforce an equal pre-eminence to both**

sides of the brain in all intellectual operations. Let us for the future change Horne Tooke's definition of the left hand as 'that which we are taught to **leave out** of use when one hand only is employed,' into 'that which is **left** for us to use when the right hand is wearied by constant work.'"

As an example of the short-sightedness of modern education, Dr. W. Ogle informs us that out of 100 left-handed persons observed by him, only four professed that they could write with their left hand, and of those four there was only one who could write fluently. What an awful waste of teaching power on the part of the numerous instructors! What a still more disastrous waste of energy on the part of the pupil! What a perversion of true educational principles, and what an irremediable loss to the 99 per cent. of unfortunate "sinisters," when we think of the mighty potentialities which they possessed, but which were crushed for ever by the misdirected zeal of parents, guardians, and teachers! Here are, say, 100 children, gifted by a freak of nature with a peculiar faculty, which, if cultivated, would place them in the very front rank of dextrous mechanics, artizans, &c., and the one object of the parent and of the pedagogue alike is to suppress that faculty, to destroy it absolutely, and thus the whole of the 100, save one, are reduced to a level below that of the ordinary mortal, the dexter left hand (if we may be allowed the phrase) being neglected and consigned to oblivion, whilst the sinistral right hand is trained and cultivated to a necessarily inferior and second-rate aptitude and skill. What wonder that Mr. H. T. Wharton and others write to the press asking such questions as the following:—"But is there any evidence that Ambidextrous people, left-handed by nature and right-handed from training, have any general mental advantage over their fellows? I think not!" ("Nature," vol. 29, p. 477). Of course not! How could they when their so-called education has been nothing less than a

fiasco and an unpardonable blunder from beginning to end?

It is recorded that one tribe of an ancient people contended against the combined forces, in war, of the other eleven tribes, and that the one tribe was successful against their numerous opponents until the Almighty interfered and reversed the order. But it is no less a fact that amongst this one tribe there was one special company of 700 left-handed soldiers who could sling stones with their left hand "to a hair's breadth," and it is widely believed that the entire tribe of Benjamin was, if not absolutely left-handed, at least strongly and widely distinguished by skilled Ambidexters of the kind named.

But in these modern times is there not convincing proof of the inferiority of one-handed or lopsided development in the prolonged war in South Africa, that so heavily taxed our resources and all but defied our most strenuous efforts to successfully terminate it? Do not the Boers use two hands where our soldiers can only use one? Is it not a fact that large numbers of them are Ambidextrous marksman? And may we not add, safely, hence to a great extent their unusual mobility and military prowess?

It MUST be just as undesirable and just as disadvantageous to have a weak, half-developed, awkward left hand as it is to have a weak and defective left eye, a left ear dull almost to deafness, or a short semi-shrivelled left leg! And it seems just as sensible to recommend the possession and also the retention of the dull ear, eye, and the lame leg, as it is to recommend the possession and retention of a clumsy and semi-cultivated left hand!

Most persons will allow that "Two heads are better than one," and surely the same holds good of our two hands! The man who can use both his hands with equal ease and skill is less likely to be at a loss than he who can use but one. He can bring more strength, and likewise more dexterity, to bear on a given task; and in

many occupations he can undertake what would be impossible to him if he had not full control of both sides of his body. Much of the every-day business of modern life tends to throw a considerable amount of work on the left hand and arm, and it is only common sense to prepare for such a contingency by training that side in the years of infancy and childhood, when mind and body alike are more impressionable than in the later periods of life.

But the greatest and the gravest disadvantage of unidexterity has yet to be mentioned and described.

We have just observed that two heads are better than one, and that two hands are better than one ; surely, then, two brains must likewise be better than one. There can be no doubt that neglect of sinistral hand culture entails a corresponding and permanent Dextrocerebral Atrophy, with an inseparable accompanying mental inferiority. It is unnecessary to quote authorities on this psychological fact, since no one disputes it. There is hardly a single medical writer named in these pages who does not witness to the intimate and vital connection between hand and brain, and to the consequent and inevitable organization of brain matter resulting from manual development and dexterity.

That a lopsided education leaves every child with an imperfectly organized cerebral hemisphere, or brain lobe —which is NEVER subsequently matured or fully developed, no, not in one person out of 10,000—must be admitted by every inquirer.

Wherefore we are none of us at our best ; but curiously enough we are not merely content to be living at some 30 per cent. below our maximum strength, we are also eager and enthusiastic in advocating and justifying such a wretched condition of things, and ever ready to decry and deride any attempt to remedy the evil by raising the standard of individual and national efficiency to a higher, and the highest possible, level.

Granted that a man (or woman) is an Ambidexter, with

both brains, or brain hemispheres, perfectly organized, and such person is obviously fully equipped for the battle of life, and MUST, in the natural order of things, SURVIVE AS THE FITTEST in the struggle for existence; whilst his (or her) one-handed rival must as assuredly diminish and disappear by "natural selection," which, as we have already seen, is as merciless in "rigidly destroying" variations of an "unfavourable" or injurious type, as it is faithful and unfailing in "the preservation of favourable individual differences and variations."

It may therefore be confidently predicted, that,

So Far as is Known—

There is no advantage, but there is every disadvantage, in our being unidextrous; whilst—

There is no disadvantage, but every advantage, in our being truly Ambidextrous!

CHAPTER V

THE POSSIBILITY OF AMBIDEXTERITY

THE question has often been asked, "Is Ambidexterity possible?" that is, can the hands be so trained from infancy that they shall become equally dexterous in all and for all functions, and be easily interchangeable on every occasion where an alternation of use would be advisable, advantageous, or essential?

Few have the temerity to deny, whilst thousands have the courage most emphatically to assert and maintain, the possibility of a general and thorough-going Ambidexterity, as will be seen in the course of the argument. Nevertheless, one medical writer in America, Dr. Gould by name, has recently come forward, and in the most dogmatic language declared that "ALL ATTEMPTS AT AMBIDEXTERITY ARE FAILURES," and that Ambidexterity is "neither possible nor desirable!"

Our own reply to the question, on the contrary, is an unqualified affirmative, and we confidently pronounce it possible for every one of ordinary capacity to become, by appropriate two-handed culture, just as accomplished in true Ambidexterity as by our present-day one-handed training we become proficient in unidexterity, or, as Dr. Gould would term it—dextrality.

There has been so much of the evasive in those who oppose the proposed innovation of bimanual skill, especially as to the real meaning of the word Ambidexterity, that before going further it will be expedient to refresh our minds as to what is exactly meant by it.

Uncertainty of any kind is both undesirable and fatal in this controversy, and no prevarication can be tolerated in the region of definitions; so it must be understood that "Ambidexterity" shall signify that state of expertness, accuracy, and rapidity in which both hands shall be equally skilful, and equally capable of performing every movement and occupation that either of them can be required to engage in—as expert, for example, in writing a letter as in manipulating the keys of the piano; in carving a joint as in buttoning a glove—AND NO MORE!

Wherefore, allowing that, as there are, and ever will be, inequalities and irregularities in the acuteness of vision in the two eyes, in the power of hearing in the two ears, and in the strength of the two legs—trifling and it may be imperceptible even to the person himself—so there will also be a corresponding inequality or irregularity in the skill of the two hands, which shall often be so slight as to be undetected by the Ambidexter himself.

With this clear idea of the precise meaning to be attached to the term Ambidexterity, or Two-handedness, we resume.

Is it not matter of common knowledge that in many exercises the left hand attains to an aptitude which the right hand has never surpassed, our opponents being the witnesses? Dr. Gould himself admits that "Pure or untrained left-handed persons are to-day as expert as their right-handed fellows. . . . It is only in a few things that one hand, &c., has the greater expertness, accuracy, and rapidity. . . . In the dextral the left hand does many tasks of as great or greater importance with equal or superior skill, as the right. . . . Especially noteworthy is the playing of the violin, 'cello, and bass viol. The fingering is done with the left hand, and forms a striking reversal of dextrality, because it is by all odds the function requiring more manipulative skill, accuracy, and rapidity. I do not know that the fact itself has ever been observed and stated, but certainly the reason for

this strange contradictory practice has hitherto escaped attention."

In passing, it may be remarked that this same fingering of these stringed instruments, in which the left hand performs the superior work, has been mentioned by several writers, and is very particularly discussed in the pages of this present Manual. Indeed, no thoughtful writer on the subject would dream of ignoring such a powerful argument in pleading for the equal cultivation of the sinistral hand.

The clear admission, then, in the above quotations is, that even at present, with no systematized instruction, THE LEFT HAND IS JUST AS CLEVER AS ITS FELLOW, AND THAT IN A LARGE NUMBER OF OCCUPATIONS IT EXHIBITS THAT PERFECT EQUALITY IN THE EXECUTION OF THE MOST INTELLIGENT, ACCURATE, AND RAPID MOVEMENTS THAT EITHER HAND CAN BE REQUIRED TO PERFORM!

On his own showing, therefore, and generally speaking, in manifold instances and in specified domains, the left hand is altogether equal to the right, for it "is given the vastly more important, difficult, and onerous task"; in other words, we may say that THE AMBIDEXTERITY IS PERFECT!

Moreover, he also lays it down as an undoubted fact that one-handedness "was an acquirement; that the law and necessity were not exceptionless; that it was due to no absolute fatalism of anatomy or physiology," and that such and such a phenomenon is another demonstration that no inherent neurologic or physiologic law governs the cerebral centre or its peripheral outworking." So, "the plastic brain on either side could take up the work."

This was in the early prehistoric or humanizing times, and we are utterly unchanged nowadays in this respect, for, to our amazement, we read a page or two further on:—"There is in all this one noteworthy neurologic

fact. In view of the long-continuance and vast preponderance of dextrality, **it seems strange that the brain preserves all the preformed mechanisms plastic and ready to make a sinistral child, and the outworking of sinistrality is as prompt, the result as dextrous as if dextrality had been chosen. The wonder at this is, however, lessened when one notes that all the functions of completed dextrality are at the same time and in the same person NOW possible to the sinistral."**

If language means anything specific, surely the above provisions signify that, from the anatomical and physiological standpoints, there is no reason whatever why the left hand should not be as expert, accurate, and rapid as the right; in other words, no reason why perfect Ambidexterity should not generally obtain.

Summarizing the premises by which Dr. Gould seeks to substantiate his hypothesis, we find that they are nine in number, and they may be arranged as follows :—

1. Originally man was absolutely Ambidextrous.
2. At all stages of man's history both lobes of the brain have been plastic, and equally capable of accommodating the speech centre.
3. The speech centre can be transferred to the opposite hemisphere by "forced training and long habit."
4. The plastic brain on either side can take up the work.
5. One-handedness is an acquirement pure and simple.
6. There is no cause in man's anatomy, physiology, or nature to make him dextral or one-handed.
7. With all persons it is only in a few things that one hand, &c., has the greater expertness, accuracy, and rapidity.
8. Left-handed persons are quite as expert as their right-handed fellows.
9. "Even in the dextral, the left hand does many tasks

of as great or greater importance, and with equal or superior skill, as the right."

Even a cursory glance at these propositions will reveal their general trend in favour of Ambidexterity, but a more careful survey of them will discover their potency and their conclusive demonstration of the possibility of a perfect Two-handedness.

Nearly half a score of syllogisms, all proving the possibility of Ambidexterity, could be formulated from these postulates, and we would ask the following five questions, based respectively on the selected and tabulated premises of the dissenting critic :—

I. If man was originally Ambidextrous (1)
If there is no anatomical or physiological reason for his present one-handed condition (6)
and If the plastic brain on either side is equally able to take up the work (4)

WHY SHOULD NOT PERFECT AMBIDEXTERITY BE POSSIBLE NOW?

II. If man was originally Ambidextrous (1)
and If one-handedness is purely an acquirement (5)

WHY CANNOT MAN BE AMBIDEXTROUS AGAIN?

III. If left-handed persons are quite as expert as their right-handed fellows (8)
and If in right-handed persons the left hand does many tasks of as great or greater importance and with equal or superior skill as the right (9)

WHY SHOULD NOT BOTH HANDS DO ALL TASKS WITH EQUAL SKILL?

IV. If at all stages of man's history both lobes of the brain have been plastic and equally capable of accommodating the speech centre (2)
If the speech centre can be transferred to the opposite lobe by training and habit (3)
and If the plastic brain on either side can take up the work (4)

WHY SHOULD NOT BOTH LOBES CONCURRENTLY ACCOMMODATE THE SPEECH CENTRE, AND SIMULTANEOUSLY TAKE UP THE WORK?

V. If man was once absolutely Ambidextrous (1)
If he is now partially but very much Ambidextrous, and in many occupations (7) and (9)
and If nothing but "an acquirement" in some remote period of his savage life is accountable for such interference with perfect Ambidexterity (5)

WHY SHOULD HE NOT BE ABLE TO REVERT TO THAT SAME AND ABSOLUTE AMBIDEXTERITY?

Is any great mental or metaphysical ability necessary to answer these five simple questions? Do not the nine propositions, if accepted as final, or even as approximately correct, decide the matter once and for all? Is it not obvious that in the face of such testimony the POSSIBILITY OF AMBIDEXTERITY is conclusively demonstrated; and are not these dicta, of the Doctor's own formulating, the best reply to his own hypothesis?

Apart from all theorizing on the subject, what is to be said of the many conspicuous examples of brilliant Ambidexters whose two-handed skill has been so marked and so remarkable in the history of the past, as well as in the records of recent times?

Sir Daniel Wilson (author of a treatise on left-handedness) says:—"I am thoroughly Ambidextrous. I use the pen in the right hand and the pencil in the left hand, so that were either hand disabled, the other would be at once available for all needful operations. When engaged in correcting a proof or in other disconnected writing, I am apt to resort to the left hand without being conscious of the change."

Professor Morse, of Princeton University, asserts that when he was engaged as a mechanical draughtsman, "there was absolutely no preference in the use of either

hand." Of this gentleman's two-handed performances, which often included the simultaneous drawing of two different objects with the two hands, a Boston paper says:—"We must not omit to mention the wonderful skill displayed by Professor Morse in his blackboard drawings and illustrations, using either hand with facility, but working chiefly with the left. The rapidity, simplicity, and remarkable finish of the drawings elicited the heartiest applause of his audience."

Sir Edwin Landseer, it is well known, was a most accomplished Ambidexter, his wonderful skill with his left hand, WHICH WAS IN NO DEGREE INFERIOR TO THAT OF HIS RIGHT, being a matter of common knowledge and of unbounded admiration.

Major-General Baden-Powell, in 1894, when incapacitated and undergoing a painful course of treatment, having been bitten by a dog, went about with his right hand in a sling, rode with the others for the twenty-one days of the manœuvres in Berkshire, and never excused himself a single duty. Being Ambidextrous, he wrote his reports every evening, as usual, and they were models of what such documents should be, and further, they were beautifully illustrated with maps and sketches; and all this with his left hand.

Mr. Simeon Snell, F.R.C.S., writes:—"It may interest you to know that I am Ambidextrous myself. From almost the outset of commencing operating I have used one hand with just as much facility as the other. This seemed to come to me naturally and without cultivating. I remember the first time, about twenty-seven or twenty-eight years ago, I operated for the removal of cataract, on the right eye with the right hand, and on the left eye with the left hand. The latter was equally successful with the one done with the right hand, and since that time I have invariably used the left hand for the left eye, and the right hand for the right eye."

Sir Hugh Adcock, C.M.G., Consulting Physician-in-

Chief to H.I.M. the Shah of Persia, tells me that "There can be no doubt that a large proportion of Persian workmen are Ambidextrous, especially the 'Nagars' or carpenters. . . . I have also observed that many other Persians use both hands indiscriminately without being in any sense left-handed, and many of them sign their names with the left hand almost as well as with the right, —H.I.M. the Shah for an instance."

In etchers, engravers, sculptors, violinists, and pianists we have innumerable and overwhelming instances of the most perfect and undoubted Ambidextral skill, where the left hand displays its consummate ability and proves itself in no wise inferior to its fellow; whilst the history of painting furnishes us with notable examples in the highest ranks of that unrivalled art. Hans Holbein, who painted alike in every manner, in fresco, in water colours, in oil or in miniature, whose invention was so surprisingly fruitful and poetical, whose execution was so remarkably quick, and whose application was indefatigable, painted chiefly with his left hand. And so did the famous Mozzo of Antwerp; the not less distinguished Amico Aspertino and the justly celebrated Genoese artist, Ludovica Genova (or Cangiagio), who, possessing such exceptional facility, skill in drawing, and fertility of invention, WORKED EQUALLY WITH BOTH HANDS.

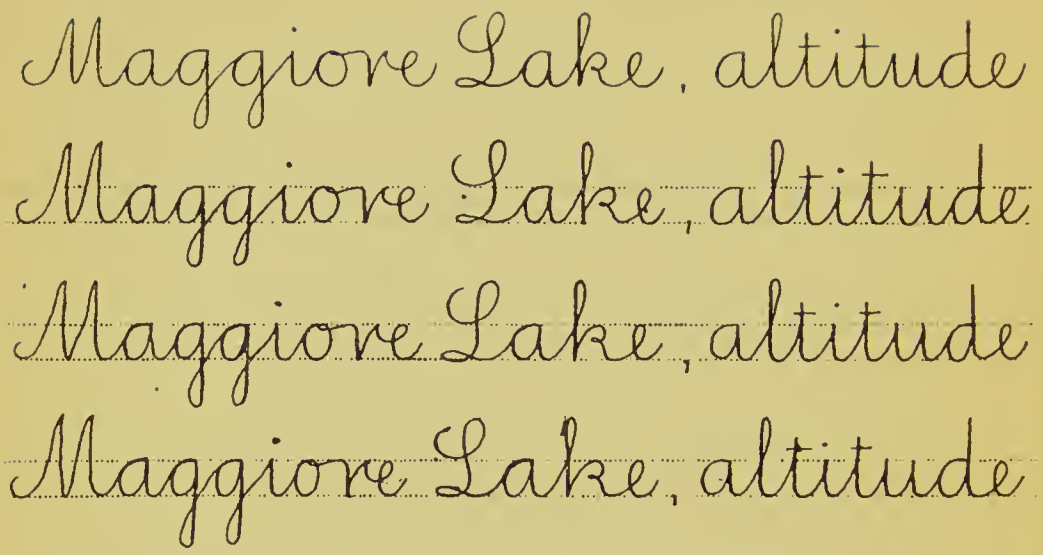
But we must not omit to give due prominence to the CHAMPION AMBIDEXTER OF THE WORLD, LEONARDO DA VINCI, "A genius all but universal, and a man pre-eminently great. In the fine arts he was the most accomplished painter of his generation, and one of the most accomplished of the world, a distinguished sculptor, architect, and musician, and a luminous and pregnant critic. In inventions and experimental philosophy, he was a great mechanician and engineer, an anatomist, a botanist, a physiologist, an astronomer, a chemist, a geologist, and geographer, an insatiable and successful explorer, in a word, along the whole range of the physical

and mathematical sciences. Serious students assure us that he was one of the very greatest and most clear-sighted, as well as one of the very earliest, of natural philosophers. They declare him to have been the founder of the study of the anatomy and structural classification of plants; the founder, or at least the chief reviver, of the science of hydraulics; to have anticipated many of the geometrical discoveries of Commandin, Autolycus, and Tartaglia; to have divined, or gone far towards divining, the laws of gravitation, the earth's rotation, and the molecular composition of water, the motion of waves, and even the undulatory theory of light and heat. He discovered the construction of the eye and the optical laws of vision, and invented the camera obscura. Among useful appliances he invented the saw, which is still in use in the marble quarries of Carrara, and a rope-making machine said to be better than any even yet in use.

"He investigated the composition of explosives and the application of steam power; he perceived that boats could be made to go by steam, and designed both steam-cannon and cannon to be loaded at the breech. He made innumerable designs for engines of war, and plans of tunnels and canals for traffic. A few of his practical inventions were carried out in his time, but the vast majority . . . were left to be re-discovered piecemeal by the men of narrower genius who came after him." (Sidney Colvin, Slade Professor, Cambridge University, in "Encyclopædia Britannica," vol. xiv. p. 456 *et seq.*)

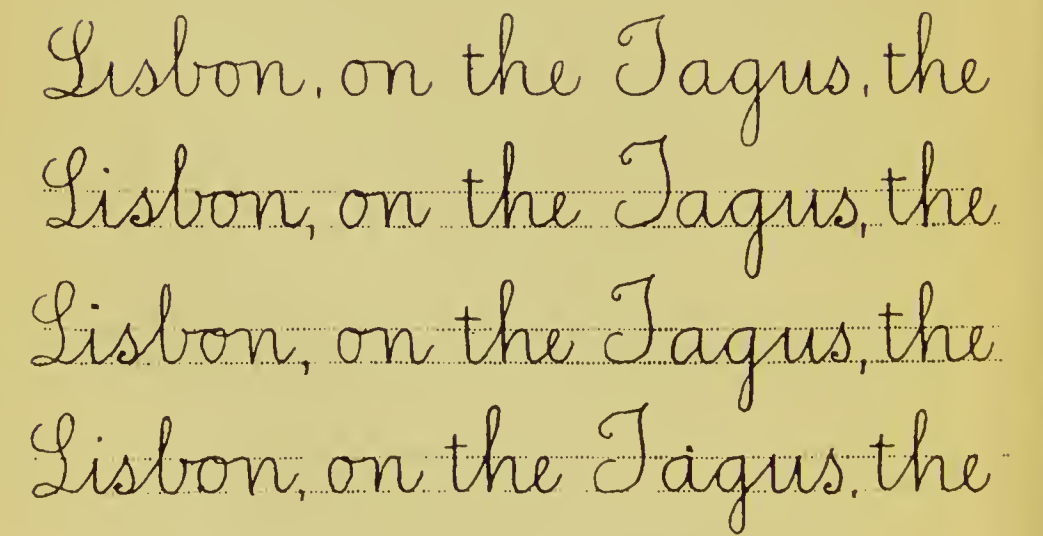
This manifold man, this "unrivalled master," we are told, "could draw with THAT INEFFABLE LEFT HAND OF HIS" (the words are those of his friend Luca Paccioli) "a line firmer, finer, and truer than has been drawn by the hand of any other man, excepting perhaps Albert Dürer."

Is not the logical conclusion obvious and irresistible, viz. that if in these particular cases such results are uniformly secured—and this by an irregular and limited course of instruction in adult life—MUCH MORE can and will



Right-hand Work after some years' practice.

Fig. 2.



Left-hand Work after a comparatively short period of practice.

Fig. 3.

be attained by a scientific system of two-handed training that shall be observed and followed in the child's life from the earliest dawn of manipulative effort to the very end of its school career?

One or two facts in support of this deduction may be mentioned. Ambidextrous handwriting (of course the style was what is known as "upright penmanship") has been introduced and practised in many schools for several years with the happiest consequences. Notably in one school—an elementary one—the inspector strongly objected to the innovation when he was first informed of its adoption, but at the end of the first twelve months of the experiment (?) the Government report read as follows:—"In the teaching of handwriting an experiment in bimanual training has met with marked success" (April, 1899). It may be added that in this same school, when several copy-books, taken at random, were produced and submitted to the inspector that he might select those pages which had been done with the left hand and which with the right hand, he was more often wrong than right in his decisions.

Furthermore, we have ourselves seen infants of six and seven years old draw simultaneously with both hands, on blackboards with chalk, natural objects in a most skilful manner that adults might even envy; and one of our senior candidates from a girls' high school where Ambidextral instruction was practised, at a recent South Kensington examination in drawing, having injured her right hand, took the paper with her left hand and PASSED WITH HONOURS.

When it is taken into account that writing is the most complex exercise that the left hand can engage in, these achievements by single persons, as well as by groups of individuals, fully and finally prove the possibility of two-handed development. Sir W. R. Gowers asserts that "To involve approximate equality in the two hemispheres of the brain as well as full practical convenience, the use

of the left hand MUST INCLUDE WRITING AS THE MOST IMPORTANT ELEMENT."

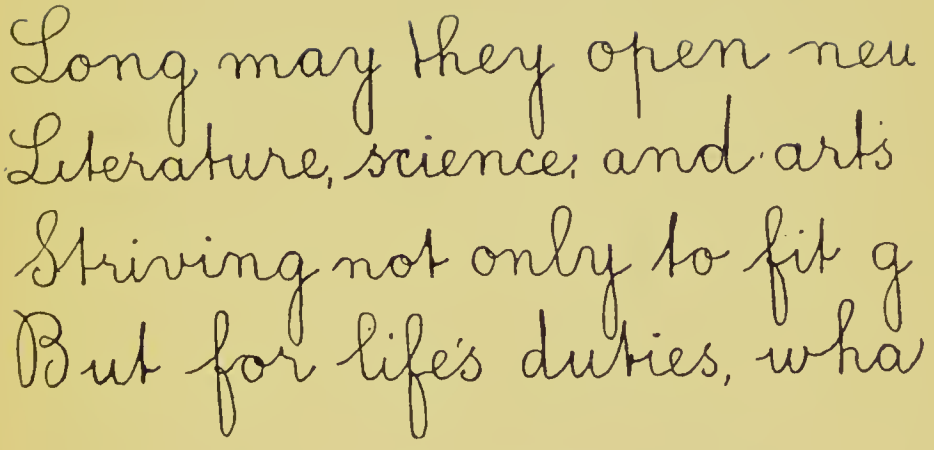
The capitals are ours.

Sir James Sawyer also remarks:—"It will be found in practice that an excellent way for the acquirement of Ambidexterity is in the learning of sinistral handwriting with pen and ink. When a right-handed man can **write** comfortably with his left hand, most other sinistral accomplishments will be added unto him."

The annual competitions in left-hand writing by school children that have now been conducted for several years, have produced marvellous results; pupils often becoming better writers in a few weeks with their left hand than they were previously with their right hand; and this even with girls in upper fifth forms, where the writing is generally considered as having become fairly matured and individualized; and where the right hand has had a start of six, seven, or possibly nine or ten years. This subject of Ambidextral writing is more exhaustively treated, however, in a separate chapter. One or two specimens are here given that perhaps will convince the most sceptical of our readers. (See figs. 2, 3, and 4.)

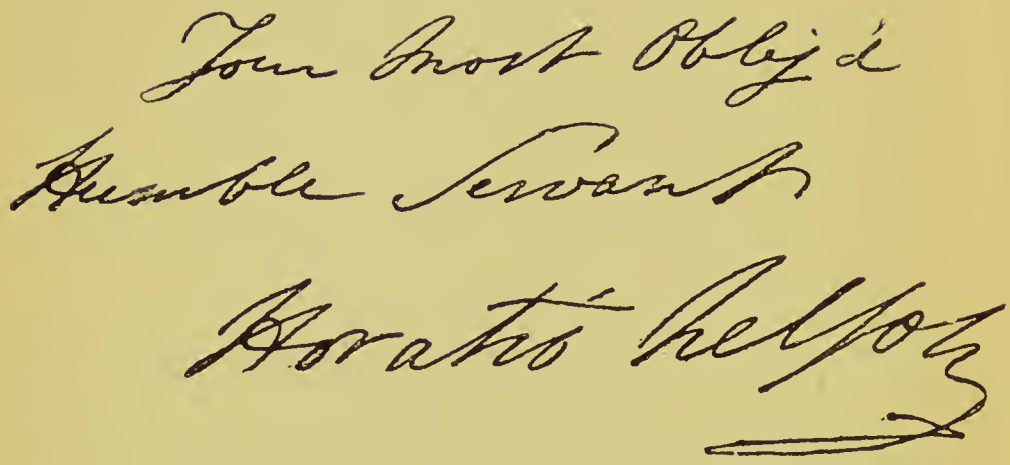
We think, therefore, that it has been satisfactorily established that Ambidextral skill of the highest order can be easily obtained, not only in the individual but in the mass; not merely in things special, but in things general and universal; and, moreover, that it can be secured without any diminution or depreciation of existing dextral ability. We go even still farther, and assert that an actual increase of right-handed sensitiveness, facility, and expertness will be the inevitable accompainment of left-handed cultivation and development.

One of the most remarkable illustrations of this still more remarkable fact—viz. that the left hand will acquire in a very short time a calligraphic excellence that required many years with the right hand to attain—is afforded in the person and experience of the renowned Lord Nelson.



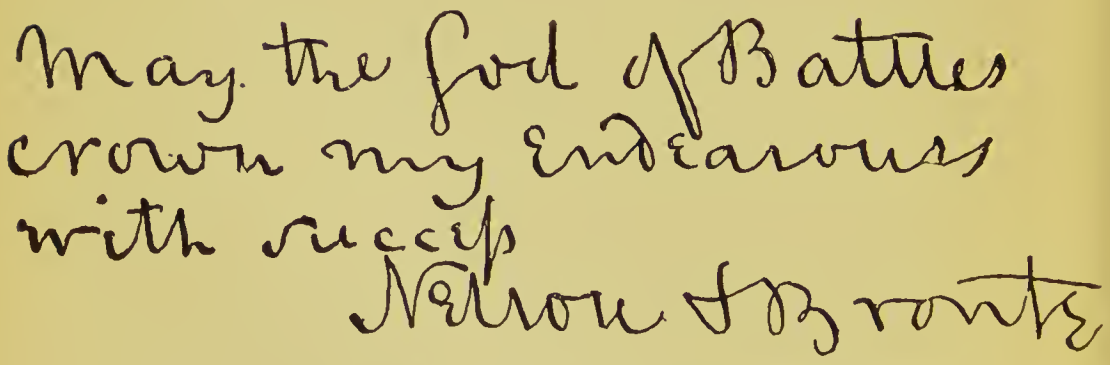
Specimen of Left-hand Writing after six weeks' practice.
Age of writer, fifteen years.

Fig. 4.



Lord Nelson's Writing before losing his right arm.

Fig. 5.



Lord Nelson's Writing with his left hand shortly after losing his right arm.

Fig. 6.

In figure 5 we see his writing with his right hand—the production of many years' training and of many more years' practice—whilst in figure 6 there is exhibited his sinistral penmanship, which was executed only a short time after losing his right arm. Both these specimens are taken direct from original documents in the British Museum. It will surely be acknowledged that the left-hand writing, in its natural uprightness and in its bold but rounded outlines, much more faithfully delineates Nelson's character than the effeminate and extremely sloping style that was the result of an external influence and education.

And this phenomenon is typical of the general result of Ambidextral culture.

The opinion expressed above as to the actual possibility of true two-handedness is not a solitary one by any means, for the views of those best qualified to judge—viz. the men who have observed, studied, tested, and experimented—are almost unanimous that "There can be no doubt that children can be taught to use both hands with equal freedom and facility. . . . Therefore the left hand ought to be educated from the first NO LESS THAN THE RIGHT" (Sir Daniel Wilson), for "there is no difference in the senses of the two sides, and there is no difference in the anatomy of the two hands." Again the capitals are our own.

THE POSSIBILITY OF A GENERAL AMBIDEXTERITY AS A UNIVERSAL ACQUIREMENT IS THEREFORE SATISFACTORILY DEMONSTRATED.

CHAPTER VI

THE ADVANTAGES OF AMBIDEXTERITY

SINCE the Ambidextral Culture Society sprang into being in 1903 no little discussion has been rife as to the exact signification of certain terms, one of which, Ambidexterity, has excited more than ordinary interest. We are not careful as to what decisions may be arrived at concerning these words with the exception of the one named, and we are quite content to accept the definition of it as found in that eminent lexicographer's dictionary that has proved the basis of many subsequent similar productions. Dr. Johnson says that Ambidexterity is "The quality of being able to use either hand with almost equal facility." Our own definition for the somewhat pedantic compound is "Two-handedness"; and this surely expresses all that need be said to define it.

The actual hair-splitting distinction that is said to exist between the terms Ambidexterity, Two-handedness, and Either-handedness, is quite a secondary consideration. For all practical purposes they may be accepted as synonymous.

The object of this chapter is to set forth as forcibly and clearly as possible the advantages accruing to any and every individual who may acquire the faculty of using both hands with equal facility.

And what so natural, what so reasonable, as to suppose that the more perfectly our limbs, members and organs are developed, and the more dextrous and useful they become, the better it is for us whether as individuals or

as a race? Is not this the sole object of all true education, whether that education be special or general? Whether it be moral, mental, or physical, should not the aim be to cultivate every faculty to its maximum development? Are not our hands given to us for this very purpose? And why one more than the other? Why should not both hands be as equally skilful as they undoubtedly are equally endowed, and equally capable for the performance of every function, exercise, and occupation that either of them can be called upon to engage in? Why should they not be actually interchangeable in **every kind** of manipulative work just as they are in a few special industries and professions, such as pianoforte-playing, surgery, &c.? Is there any obvious advantage in letting one of our hands do most of the work, and the other very little of it—in depriving ourselves of at least 30 per cent. of our effective working power? And is there any justification for making such an invidious distinction between the two lobes of the brain, laying double strain upon the left, and relegating the right to inaction and atrophy, whilst as an inevitable consequence the right hand, and hence the left brain, is educated to a dangerous activity, the intelligence and ability of the left hand being smothered in sloth and neglect?[1]

Some little progress has been already made in the campaign inaugurated by the Society named, and it is gratifying to note that wherever the experiment has been tried, Bimanual training has had a most beneficial effect upon the scholars and students—not merely in the additional manual skill acquired, but also in an increased mental acumen, and a material improvement in bilateral symmetry and physical balance.

Theoretically the advantages of two-handedness are

[1] The left lobe drives and controls the right side of the body, and the right lobe controls the left side.

incalculable; practically they are not one whit less valuable. For convenience they may be divided into (1) Medical or Physiological; (2) Mechanical; (3) Economical; (4) Miscellaneous.

1. The Medical or Physiological Advantages.

These are two-fold: (*a*) Preventive, and (*b*) Positive.

(*a*) Preventive.—According to Sir W. R. Gowers, M.D., there is every reason to believe that Aphasia, or loss of speech, would be to a great extent prevented by the general adoption of Ambidextral teaching. We quote his remarks on the point:—

"One strange fact must be noted. Although these centres are apparently similar on the two sides, only those speech centres on the left side of the adult brain have a special relation to the will. Not only are the centres similar in the two hemispheres, and connected in a similar way with the organs for utterance and hearing, but those on the two sides are connected with each other by fibres which pass between them, and form part of the great connecting mass between the hemispheres. Yet only the left centre can manage voluntary speech.

"It is indeed a mysterious fact. If the lowest part of the central convolutions on the right side is destroyed by disease, speech is not interfered with beyond the slightest transient weakness of articulation. If, in an adult, the same region on the left side is destroyed, the result is absolute loss of power of voluntary utterance. Words cannot be produced by the will; there is 'Aphasia.' . . .

"This relation of the processes for language to the left side of the brain is unquestionably connected with right-handedness. Every one knows, or should know, that the relation of each half-brain to the body is crossed, and that the right hand is worked by the left part of the brain, which subserves voluntary speech. Persons who are left-handed present the same defects of speech in disease of

the right hemisphere of the brain as right-handed persons do in disease of the left. They are right-brained.

"Destruction of the motor speech centre, in the left half-brain of the adult, causes absolute loss of power of producing words. It is not defect of articulation, but inability to produce the motor arrangement for words to act on the structures which cause articulation. As already stated, 'yes' and 'no' are usually regained before long, and it is curious and perhaps a significant fact that 'no' always returns before 'yes.' Some persons never regain any other use of words; other persons, in the course of a few months, acquire a very considerable amount of voluntary speech which goes on increasing. This must be by the acquisition of this special use by the right hemisphere, because the speech that has been regained is again lost if there is afterwards similar disease of this hemisphere. But the fact that there is this variation between different individuals in the amount of speech regained—that is, in the capacity for substitutionary work by the right hemisphere—is a fact of great importance.

"A related fact is also of importance for those concerned in education. In children destruction of the left motor speech centre never causes lasting loss of speech as it does in adults. However complete the loss may be at first, speech is regained, and, before long, it is difficult to detect any imperfection. There must, therefore, be a capacity for the acquisition of voluntary speech processes on the right side of the young which there is not in the adult.

"These facts show that the exclusive relation of voluntary speech to the left brain is due to the disuse for speech of the right brain: it seems to occur in the transition from childhood to youth, and it is related to the use of the right hand.

"An important question is thus raised. . . . What would be the effect on the functions of the brain of the systematic cultivation of Ambidexterity? By this I mean

the systematic compulsory use of the right and left hands equally for all manual occupations, including writing. . . . The result would certainly be, as far as can be judged from present facts, to secure an immunity from the grave effects on speech of disease of either side of the brain, should such disease occur."

This disease of Aphasia, together with its related "Agraphia," is becoming more prevalent every day, a circumstance calculated to raise serious apprehensions as to the future, if nothing be done to arrest its advance.

We cannot be indifferent to the alarming nature of a malady that deprives its victim of the power of speech, so that he can neither read, nor read to himself, nor can he write, either from himself or from dictation: he can merely understand what is said or read to him.

As with Aphasia and Agraphia, so with other kindred cramps that afflict thousands of sufferers; there is therefore the more significance in the comments of the writer just quoted, and also of "The Lancet." Sir W. R. Gowers says: "Among the chances of this mortal life, one that is not to be disregarded by the breadwinner is temporary or permanent inability to use the right hand through disease or accident. This is especially conspicuous in disastrous effect when one who earns the 'living' of himself and others by writing develops the persistently increasing cramp which at last makes working impossible. . . . The power of using the left would be of very high value in these cases. Not less, moreover, with equal ability to use either hand, would be the opportunity thus afforded of giving useful rest to one or the other, in the many occupations that involve long fatiguing strain. Who, with many hours' hard writing to do, would not be thankful for the power of using either hand with the same facility, and of resting one or the other as fatigue enjoins?"

And similarly "The Lancet": "There can be no doubt that a clerk who could write with equal facility with

either hand, and could rest one side of the body while the other was working, would be little liable to Writer's Cramp and similar troubles."

Dr. G. V. Poore, whose experience in the treatment of "Nervous Diseases of the Hand" is so varied and extensive, refers to this frequent complaint as: "'Writer's Cramp,' so called because it is infinitely the most common of all, and because, in the stress of the nineteenth-century competition, it bids fair to become still more common. I am sure I have seen and closely examined and studied at least three hundred of these cases." He also informs us that: "Congenital left-handedness is not an infrequent cause of writing difficulty, and these patients will tell you that writing has always been to them a labour and a sorrow, and you will learn that, whereas they perform almost all other delicate acts with the left hand, they have been driven to use the right for penmanship by dint of the obstinacy of their writing masters." And again he offers "one word" of explanation as to "prevention" of this fell disease, a word as significant as it is decisive: "The only remedy for this is to teach the child to write with both hands, which I believe might easily be done. The writing would have to be upright instead of sloping. We educate the left hand far too little. Girls in this respect are better off than boys, for such exercises as piano-playing and knitting encourage a great amount of Ambidexterity in girls. Why should not the clerk use either hand alternately, and so give to each its much-needed rest?

"What effect has the exercise of the periphery upon the development of the centre? By constantly using the left hand for written language, might we not possibly educate our right Broca's convolution instead of letting it lie idle?

"I once gave utterance to these opinions and speculations at the bedside, and at their conclusion a student of more than ordinary intelligence asked me whether the

extreme fluency of the female organs of speech might not be due to the fact that the right side of women's brains had been developed by a more constant use of the left hand than is common in males?"

Medical men indeed seem to be unanimous as to the many and material advantages of a two-handed development, as will be seen from the following specimens.

Dr. James Shaw writes:—"I quite agree with you as to the many and great advantages of Ambidexterity. Some of them, e.g. the prevention of Aphasia and the avoidance of Writer's Cramp, have, owing to my special attention to nervous and mental diseases, been before my mind for many years. It is also obvious that the helplessness of a hemiplegic patient, or of one whose leading hand or arm has been lost or seriously injured, would be very much diminished if he had been previously Ambidextrous."

Dr. Hollis asserts:—"We cannot doubt that had such a person, from his childhood, learnt to write readily with either hand, the paralytic seizure would have been postponed. . . . It is, perhaps, too much to say that none of these attacks would have taken place had the patients allowed each side of the brain to participate equally in the work, but, speaking with some reservation, I believe it is probable that the disease would have been indefinitely postponed had their education been other than lopsided."

Beyond all this, there are other serious ailments specially incident to school life that would be ameliorated, if not, indeed, entirely avoided. "Spinal Curvature" affects large numbers of our children, who, in multitudes of instances, remain deformed or crippled for life; and this serious disease is very often induced by the constant assumption of certain bad postures which engender this deformity.

Mr. Noble Smith, F.R.C.S. Edin., writes:—"I consider that the teaching of Ambidexterity in elementary and

secondary education is one of the most valuable innovations in tuition of the age. Surgeons and physicians who specially study the physical and mental development of growing children have again and again urged the importance of preventing the assumption of bad postures, but it has been a hard task to overcome the one-sided tendencies of right-handed pupils. The teaching of Ambidexterity gets rid of the prime cause of this one-sidedness, and tends not only to develop the body symmetrically, but also to exercise the brain and all other great functional centres equally. Ambidexterity will, I believe, do more to prevent bodily deformity than all the elaborate systems of exercises (valuable as they are) upon which we have greatly depended, and will tend to correct those deformities when once engendered."

Then there are other affections, both pulmonary and gastric, that would be sensibly diminished by the relief afforded to the body by such an alternation of hands and frequent change of posture as Ambidextral skill alone renders possible. Hence it is safe to conclude that the Preventive Advantages of Two-handedness are so numerous and valuable, yea, and vital also, as to justify and demand its introduction and teaching generally throughout our primary and secondary schools.

(*b*) Positive.—However, it is when, in this physiological relation, we consider the positive benefits accruing from a universal Ambidexterity that we are irresistibly convinced of its undoubted virtues. From the testimony of our great neurologists we conclude that by this symmetrical development of both hands the brain speech area would be doubled, and the lobe which in one-handedness suffers atrophy of its motor speech centre and processes through disuse, would no longer be subject to that deterioration and loss; the entire mentality would consequently be quickened, and the intellectual powers materially strengthened. Wherever Ambidexterity has been taught, even to a very limited extent and in a very

few subjects, this assumption has been fully confirmed, and the most surprising results in these respects have been recorded.

Mr. J. L. Tadd, who has taught two-handed work in his large classes at the Philadelphia Public School of Industrial Art, of which he has been director for the past twenty years, speaks in the highest terms of the effect upon his scholars and students. "The result of this work has only to be seen for one to become impressed with its value as a medium for the education of the individual. The most sceptical are convinced by the perfect results produced, the simplicity of the work, the almost instant balance and symmetry, and the visible development in the direction most to be desired in the education of the hand, the eye, and the mind. . . . The pupils stand better, hold their heads more erect and level. In a word, they have more understanding. The reason we do Ambidextral work is for the physical co-ordination acquired. Biology teaches that the more the senses are co-ordinated to work in harmony in the individual the better. . . . In truth, I exercise some special region or centre of the brain in every conscious movement I make, and in every change of movement I bring into play some other centre. I am firmly convinced that the better and firmer the union of each hand with its proper hemisphere of the brain, and the more facility we have of working the two together, and also independently, the better the brain and mind, and the better the thought, the reason, and the imagination will be. The results of this method have fully demonstrated this fact; as the teachings of modern science, and specially of psychology, have fully established the truth of this contention."

A very curious effect, and one not less important, is met with in the development of this two-handedness or two-handed culture. Incredible as it might seem, the right hand benefits to a sensible extent by the co-operation and training of the left. It is not a question of

changing the superlative dexterity of *one* hand, the right, for an inferior or second-rate facility and expertness in *two;* for there is not a doubt that the naturally dexter hand becomes—by the sympathy and cultivation of its sinistral fellow—more sensitive and capable than it can or would otherwise be. Teachers write me saying that their pupils repeatedly assure them of the fact that they "find it easier to write with their right hands, now they have to write with their left also." And after twelve years' observation of his Ambidextral teaching, Mr. Tadd contends:—

"I claim better results for the right hand when the left is worked also, than from the right hand working alone in the same space of time in almost any kind of handiwork."

But there is yet another benefit accruing from such an innovation that we think has escaped general notice. I cannot help thinking that by the equal training of both hands (which, as we have seen, carries along with it the sequential development or organization of the two brain lobes, also equally and similarly) the moral sense will be perceptibly, if not proportionately, raised; that the individual will thus be enabled to discern more readily and surely right from wrong; and that he will also be stronger both to follow the right and to resist the wrong than he could be as a lopsided person with only one brain-lobe fully and perfectly organized.

If I am not mistaken, Dr. Wigan entertained the same view, and since these lines were first written I find that Dr. Seguin mentions this phenomenon as being an invariable accompaniment of his system of Ambidextral hand-training of the feeble-minded and idiot children under his care. He says: "The necessity of working the hand is urged even upon higher grounds than mere physical or intellectual advantages." And he goes on to show how immoral habits and tendencies, in all their diversified manifestations amongst the idiots and imbeciles, diminish

according as the powers of prehension and intelligent handling develop themselves, and just as the hand becomes more and more the instrument of expression for the mind.

I have no doubt that the near future will yield some results in this direction of a very remarkable kind, and that morality and manual development will be found to be more closely allied than we at present suspect.

Dr. Wigan remarks:—"I believe myself to have good reasons for asserting that feeble intellect is accompanied by imperfect command of the fingers, and that, notwithstanding the difference of origin, the two are almost always conjoined. It is a common remark (often laughed at) that you may tell a man's degree of intellect by his handwriting; and, with considerable limitation, there is truth in the assertion. I never yet saw a feeble, undecided mode of writing in a man of strong talent. However bad or illegible, there are always force and decision. The converse of the proposition does not, however, hold good; because the muscular power of the fingers may be cultivated by tuition and practice, till a half-witted man shall write like one that is sensible, as we see among attorneys' copying clerks, who all write exactly alike. The want of control over the hands is, however, generally an accompaniment of weak intellect, and in extreme idiocy they absolutely hang down from the wrists, and there is no power over them whatever."

Indeed, the vital connection between the brain and the hands is nowhere so clearly shown as in the treatment of the feeble-minded children. The paramount importance of hand-training as a brain-organizing potency is conclusively established in the following extracts from Dr. Seguin's works:—

"The general training embraces the muscular, imitative, nervous, and reflective functions, which are susceptible of being called into play at any moment. All that pertains to movement, as locomotion and special

motions; prehension, manipulation, and palpation, by dint of strength or exquisite delicacy; imitation and communication from mind to mind through languages, signs, and symbols; all that is to be treated thoroughly.

"Then from imitation is derived drawing, from drawing writing, and from writing reading, which implies the most extended use of the voice in speaking, music, &c. The same provision is to be made for the use of both sides of the body; the left being made competent to do anything for the right.

"Prior to any education, the hands are like impediments, if not brandished upwards by automatism, impressing their disharmony upon the rest of the body. This being almost always the case with our children, we cannot improve either their walk or conception without improving their hands and arms, at least as instruments of equilibrium.

"When we come to consider the hand in idiots as an instrument of function, we are not more struck with its physiological disorders or deficiencies than with the almost universal anomalies of the organ. Considering the gravity of this infirmity as shutting the being out from any intercourse and creating the most positive isolation, the task of teaching prehension can never be commenced too soon.

"The hand is to be trained for years in these exercises. Prehension is more physical, handling more intellectual.

"The hand is the best servant of man, the best instrument of work, the best translator of thoughts.

"The most important use of the hand, its aggressive capacity, is generally assisted by adjuvant instruments.

"The sense of touch being the most general, and in fact all the other senses being mere modifications of it, we shall begin by it the training of the child.

"The tactile function is the most important of our senses.

"The experiments are of three kinds: first, to culti-

vate the perception ; second, to transmit it ; and third, to give the knowledge of it."

As a medium, then, for training the eye and for developing the mind, the hand stands alone. Its potency in these respects will be seen in the following typical example :—

The hand of an idiot child before training was small, the nails were dry and brittle, the fingers short and badly finished. There was no power of resistance to pressure, no use in the hand whatever. Movement there was, but it was purely automatic, and the child was quite unable to carry out the simplest direction which involved voluntary action.

The result of one year's daily training of this interaction and reciprocal action between the brain centres and the peripheral nerves is simply amazing.

The child had learnt to help itself, to occupy itself, to amuse itself. It ceased to shove its fingers into its mouth to be bitten, and it ceased to strike its companions. The touch was developed so far that the child would appreciate the ordinary differences of temperature in air, water, and food, and would recognize and name **blindfold** by mere sense of touch some fifty objects.

He learnt to recognize many things, to hold things, to put things down, to grasp, throw, &c., and it took him a year before his hands, at first as flaccid as in death, could button a button or brush his coat.

Thus we see that the dormant spark of intelligence—the latent germ of Mind—can only be evoked, can only be developed, by Hand Culture. But it is equally true that the healthy mind is likewise dependent to a wonderful degree upon the hand for its growth and development ; and hence similar results invariably follow upon the adoption of Ambidextral training in certain of our schools.

Once more, Hand Culture and Memory Culture are inseparably connected. It has been known for many

years by those whose work it is to study brain development that by the cultivation of both hands the memory is sensibly and permanently strengthened. Such discoveries may seem incredible to the lay mind and to the ordinary reader, but so true is this fact that our great memory specialists and those who have devoted much time and labour to the investigation of memory development are unanimous in recommending two-handedness as one of the most powerful adjuncts to strengthen the retentive and reliable qualities of the memory. Thus, "Mr. Pelman has for years been advocating and teaching the value of Ambidexterity" as a memory developer!

When the inestimable value of a thoroughly retentive and reliable memory is once appreciated, the expediency—nay, the necessity—of a universal system of Ambidextral Culture will be immediately insisted upon by every rational mind.

We cannot afford in these days of such keen competition to neglect, or even to undervalue, any aid to efficiency, any element of strength, or any essential factor in the product of our individual personality, or of our national constitution; wherefore, when we meet with such a potency, such an undoubted agency for the advantaging of our people, it becomes obligatory to utilize it, that nothing be lost.

If, then, with only a partial education of the sinistral hand, if with only an imperfectly developed two-handedness, such beneficial results are obtained, physically, morally, and mentally, what may not be confidently anticipated from a complete and scientific scheme of Ambidextral instruction that shall include every grade of school, and every possible variety of manual occupation? In any case, it must be conceded that by no other means can our children secure the maximum good from their school life and training. And it will also be admitted that the uniformity in the results already obtained under circumstances relatively very disadvantageous, warrants

the assumption that a material improvement of our people, both in physical and mental calibre, would inevitably follow the adoption of such a scheme of general Bimanual training.

2. The Mechanical Advantages.

In the world of Industrial Art, in the domain of professional manipulation, in the realms of manufacture, sport, and unskilled labour, fully matured two-handedness would be of the most supreme value. It is impossible to estimate the worth of such a universal faculty permeating every department of life and activity. There are not less than 500 occupations (and possibly there may be almost double that number) in which the worker will reap no little advantage by the possession of two equally and perfectly dextrous hands; whilst in a large proportion of them such a facility is essential, e.g. in carving, engraving, modelling, and chasing.

Now what are the specific benefits accruing to the individual in such a case? First of all, there is the advantage of alternation, where the worker can rest each hand in turn as it becomes tired or fatigued by long-continued strain. Thus, not only is the worker himself advantaged, but the work itself is of a higher type and certainly superior by being executed by a vigorous hand; and herein lies a second advantage, that a material improvement in the workmanship is effected. Furthermore, by this avoidance of overstrain and undue fatigue, the clerk, artizan, author, and all other such workers, are not only better fitted for their daily duties and better qualified to meet any emergency, but their powers of endurance will be strengthened, and they will naturally live longer and more happily than they could otherwise do. The dire effects of over-pressure are thus minimized, if not altogether averted, and a general raising of the health-standard will inevitably ensue.

The advantages of this Ambidextral qualification, then,

are, in the words of Sir W. R. Gowers, "utterly inconceivable by those who have never possessed them."

"In my scientific work I have accustomed myself to the use of both hands almost with equal facility. In very delicate work, such as section-cutting and diatom mounting, or very delicate dissecting, I soon acquired the ability to use either hand with equal facility, thereby saving time and securing better results." (The Rev. Dr. Dallinger.)

"The advantages to an ophthalmic operator, of being Ambidextrous, are very great." (Dr. Simeon Snell.)

"The training of each hand for writing or other mechanical work is good, and likely to prove in a high degree useful." (Dr. H. Charlton Bastian.)

"It is of the greatest service to me to be able to manipulate with both hands with nearly equal dexterity." (Professor H. N. Morse.)

"If such teaching is good for the seeing, it is far more necessary for the blind. You speak of pianoforte and organ playing, but it is most useful for our pupils in all departments. We endeavour to carry out this principle in all our physical training." (Dr. F. J. Campbell.)

"I am very much in favour of encouraging the use of the left hand for independent action, as it has always seemed to me inexplicable that the function of the left hand should, by almost universal practice, be regarded as merely auxiliary to the right. When a boy, I trained my left hand to be as familiar as its fellow with foil, single-stick, knife, scissors, &c., and I even learned to write." (Surgeon-General A. F. Bradshaw, C.B., Hon. Physician to the King.)

It is not possible to describe in detail the advantages springing from the possession of Ambidextral skill in our handicrafts, and in all mechanical work; they are more fully treated elsewhere; but before passing from the subject it may be well to draw attention to the great advantage possessed by an Ambidexter in Handwriting alone.

By the term Ambidexter is meant one who can not merely write interchangeably, and equally well, with both hands, but who is also able to write with both hands **at once**, whether the matter is the same or quite different. That children can learn this rare and valuable accomplishment as easily as they can one-handed writing, is indisputable, and that they can become as adept at the work is just as true, for both facts have been demonstrated again and again in actual practice in the individual and in class tuition.

It is no exaggeration to say that in this one department of calligraphy the advantages of two-handedness are immense, more particularly to clerks, reporters and literary men.

3. Economical Advantages.

The economical value of Ambidextral development is of almost equal importance. We do not theorize here. The saving is a very concrete factor in all manual exercises. The child at school learns more quickly, apprehends more instinctively and immediately, acquires more surely, retains more permanently, and executes more deftly; hence the teaching power is lessened or lightened, and the school-life of the pupil sensibly shortened.

Leaving the schoolroom for the workshop, the drawing office, the factory, or the cricket field, what a tremendous saving is effected in learning any of these crafts or sports if the apprentice, articled pupil, or student is a full-fledged and perfect Ambidexter! Not only will the work be mastered much sooner, but in all after time the workman will be more expert and better qualified for the execution of his daily duties. It is unnecessary to dwell longer on this part of our argument, since it is patent to every one that the possession of two fully equipped and skilful hands must invest the workman with a qualification that shall secure an economy of time

and workmanship that will indisputably prove the financial value of Ambidexterity in this respect. From the economical standpoint it pays to be truly Two-handed.

4. Miscellaneous Advantages.

There are manifold and collateral advantages inseparable from Ambidexterity, and of a somewhat miscellaneous character, that are worthy of notice. For example, with respect to our Navy and Army (both Regulars and Volunteers) we have it on unimpeachable authority that the effective strength of both services would be very much increased. Our Jack Tar is much more Ambidextrous than his brother Tommy Atkins, or than the ordinary civilian. But were all our soldiers and sailors capable of wielding the sword, carbine or the rifle equally with either hand, firing from either shoulder with equal rapidity and precision, and using the left hand (or the second one, whichever it might be) when the other was disabled, with perfect skill and undiminished vigour, surely their fighting efficiency would be increased at least 30 to 50 per cent. Is not this a desideratum to be resolutely contended for?

The testimony of Major-General R. S. S. Baden-Powell, C.B., is specially relevant to this point. He says :— "There is no doubt that the value of Ambidexterity from a military point of view is immense. I do not consider man is a thoroughly trained soldier unless he can mount equally well on either side of his horse, use the sword, pistol, and lance equally well with both hands, and shoot off the left shoulder as rapidly and accurately as from the right."

If these things are indeed so, what is our War Department doing to neglect such a vital element of strength and efficiency? Can we afford thus to trifle with our country's interests and safety?

And what would be the consequences in the region of

penmanship were Ambidextral Instruction to become the law of the land? One result and advantage of great value would be to banish once and for ever those terribly injurious styles of Sloping Writing that work such havoc on the spines, the lungs, and the eyes of our school children, and to introduce Upright or Vertical Handwriting, that is not only equally adapted to both hands, but that is so easy and natural to produce, and that is in the highest degree at once Hygienic, Legible and Rapid.

One of the greatest merits of this proposed innovation is the absolute ease with which it can be introduced. Radical reforms as a rule make heavy demands upon our resources or organization, but in this instance the contrary is the case. No costly apparatus, no intricate machinery, no extra staff, and no expensive text-books are required. Not one additional piece of school furniture, not one interference with the usual routine, and still the proposed reformation may be an accomplished fact throughout the length and breadth of the land without a hitch and without a shock. A fiat from the Education Board to-day, and to-morrow the systematic teaching of Ambidexterity would be methodically taught to every pupil and in every school, whilst the existence of a nation of accomplished Ambidexters would be practically ensured. This is not an exaggeration. Nor is it essential that our teachers should have any preliminary preparation for the teaching of the subject. If they can teach the child to use its right hand, even so they are equally competent to teach it to use its left. In writing, transcription, dictation, arithmetic and other manual exercises, the left hand simply and similarly shares the work to be done; so in drawing, carpentry, cookery, sewing, games, and all other occupations. By this easy transition the children will become adepts in two-handed work in a comparatively short time, and a corresponding improvement will be observed in all departments of the school.

It must ever be borne in mind that Ambidextral Culture aims at (*a*) developing the building power in thought by exercising the channels of expression; (*b*) stimulating activity of perception; (*c*) increasing facility of expression in writing and every other manual function; (*d*) organizing the speech and motor areas and centres of the brain; (*e*) securing the greatest skill and the most perfect *technique;* and (*f*) qualifying for the greatest number of occupations.

To exhibit in the best way the miscellaneous advantages of Ambidexterity, recourse shall be had to the evidence of those who are either possessed of the faculty themselves, or who have investigated and studied the subject theoretically and professionally, and who are therefore well qualified to speak with some authority on the question.

"I desire to join in recommending the general culture and adoption of Ambidexterity. I have given some attention to the subject for many years. Each of our hands is capable of all those refinements and all that precision of movement which are usually only developed and exercised by the right hand. Perhaps there is no other occupation in which it is not an advantage to be able to use either hand with a power equal to that of its fellow. In our manifold profession Ambidexterity is a great equipment. Ambidexterity would prevent many occupation *pareses*. . . . It would tend to a more equal use, and to an alternative and reciprocally resting use, of the two sides of the brain. It might prevent, or help in the cure of, some cases of hemicrania. Perhaps it might prevent some cases of hemiplegia." (Sir James Sawyer, M.D.)

"Education, training by persistent effort, will overcome the natural tendency to dextral preference, and will render the individual more clever with the non-preferred hand, more equally adroit with both sides of his body, more symmetrical in muscular growth; will tend to equalize the two halves of the brain, giving a better

cerebral development, and will consequently render him more serviceable to society and himself." (Dr. Wyeth.)

"Very many of those who are strongly left-handed have found their peculiarity a very decided advantage to them. . . . By learning to write and to perform other delicate movements with the right hand, they acquire, without impairing the natural aptitude of the left hand, much more dexterity with the right than right-handed persons ever attain to with their left hand, and thus in many cases reach a degree of Ambidexterity which renders them, instead of *gauche*, peculiarly clever and skilful in their manipulations. It is amongst those originally left-handed persons that men would be found like David's companions, who could use both the right hand and the left in slinging stones and in 'shooting arrows from the bow.'" (Dr. R. A. Lundie.)

Dr. R. A. Lithgow says he has found his "double-handed condition of the utmost utility in midwifery and surgery."

Dr. Hollis strongly urges that we should "adopt a system of education which will enforce an equal prominence to both sides of the brain in all intellectual operations. Physicians have already learned to relieve the right eye and ear by employing them in turn with the left at the microscope and stethoscope."

Charles Reade, writing to the "Daily Telegraph" some years ago, argued, and truly too, that if the habitual use of the right hand led to a greater development of the left side of the brain, a further acquired use of the left hand would aid the development of the right lobe, and by that means increase the general power of the brain. This unanswerable argument, so interesting and applicable to every individual member of the human race, seems to have fallen on deaf ears, for although there was a vigorous correspondence, the subject dropped as suddenly and completely as if it had been the most trivial and contemptible

nonsense that ever dribbled from the fingers of the feeblest penny-a-liner.

Let any serious-minded man sit down and estimate, if he can, the appalling loss in brain power, in inventive genius, in muscular energy, in effective fighting strength, in time and money, that our British Empire is suffering every day of its existence by neglecting to avail itself of this wonderful potency that is lying dormant in its very (left) hand. But there is still more to follow, and of a still more convincing character.

The following remarks, taken from an important work published one hundred years ago, will show that these views are by no means new or extravagant :—

"It may be imputed to education and habit, that men as well as brutes are not all Ambidexters, there being no difference of right and left in the nature of things. Nurses are even forced to be at some pains to insure the infants under their care to forego the use of their left hand. How far it may be our advantage to be deprived of half our natural dexterity, may be doubted. It is certain that there are infinite occasions in life when it would be better to have the equal use of both hands. Surgeons and oculists are of necessity obliged to be Ambidexters.

"Divers instances occur in history where the use of the left hand has been cultivated preferably to the right. Plato (B.C. 420—347) enjoins Ambidexterity to be observed and encouraged in his Republic.

"In the Grecian armies their more distinguished soldiers, their pikemen and halberdeers, as those who formed the first line of their battalions, were to be able to fight indifferently with the left hand or the right.

"An ingenious French writer is surprised that, among all the modern refinements in the art of war, none have thought of restoring the ancient practice of forming Ambidexters, which, it is certain, might be of considerable service in the way of stratagem.

"In performing on keyed instruments, the harp, the

dulcimer, and such as have a separate part for each hand, Ambidexterity is necessary. On the pianoforte and organ, two right hands are so necessary, that a child rigidly prohibited the use of the left hand in the common offices of life can never have a powerful left hand in performing on the instruments just mentioned ; but in rapid divisions, fugues, and imitations, the clumsiness with which difficult passages are performed with the left hand disgraces the player and injures the composition. In the serious studies and practice of the student on the pianoforte intended for the profession, it might be necessary for him perhaps to try to execute all kinds of feeble passages, shakes, and trills with the left hand till they can be played with so much ease and brilliancy, that a distant hearer, out of sight of the instrument, shall not be certain which hand has been employed."

Another advantage of Ambidexterity is the faculty of simultaneous or concurrent work which it confers. There are many occasions in life where this coincident dual action of the two hands is of the first importance, there are even more of the handicrafts of trade where the same thing is demanded, and where continual two-handed activity is essential to the industry or occupation, as in weaving and piano-playing.

And, again, divers situations will arise and frequent emergencies will be met with in life where dual dexterity and simultaneous action are of vital consequence. To be able at such times and seasons to use both hands with equal and independent facility and expertness will often prevent a broken limb and save a threatened life. The philosophy of concurrent handwork may well be relegated to a separate chapter, but that the power of using the two hands with equal dexterity in simultaneous and unrelated movement is an inestimable possession, cannot be gainsaid or disputed.

An ordinary course of Ambidextral training, therefore, will enable every child to exercise a complete mastery

over both hands in this respect; and on leaving school each candidate for life's honours, whether boy or girl, will be competent to write two different letters at the same time, draw and write at the same time, and use both hands in any other two (similar, or totally distinct) movements or actions concurrently, without the necessity of painful preliminary training and practice.

Having ascertained the effects of Ambidexterity on the individual, it may reasonably be asked, what about the mass, the nation, and the race? History, ancient and recent, furnishes a complete and satisfactory answer to the question.

In the first place we must hark back to "a people who flourished and, according to Sir Isaac Newton, who spread themselves over lesser Asia and Europe before the year of the Flood—1220—that is about the latter period of the Israelitish Judges."

We are told then that "BY THE LAWS OF THE ANCIENT SCYTHIANS, PEOPLE WERE ENJOINED TO EXERCISE BOTH HANDS ALIKE, WITHOUT PARTIALITY EITHER FOR THE RIGHT OR LEFT."

Now their history is very remarkable reading, and the following description of them is gathered from such writers as Justin, Thucydides, Pliny, Herodotus, Lucian, and Josephus, not one of whom recognizes any connection whatever between the Ambidexterity of the Scythians and the valour and virtues which alike distinguished them. The testimony is therefore all the more trustworthy.

Justin (the great Latin historian, second century) says of the Scythians that they "were a nation, which, though inured to labour, fierce in war and of prodigious strength, could nevertheless so control their passions, that they made no other use of their victories than to increase their fame.

"Theft among them was reckoned so great a crime, and was so severely punished, that they could let their

numerous flocks wander from place to place without danger of losing them. . . .

"What is still more wonderful, those virtues which the Greeks in vain endeavoured to attain by learning and philosophy were natural to them, and they reaped those advantages from their ignorance of vice, which the others could not derive from their knowledge of virtue. . . .

"Scarcely is there any nation to be met with in history so famous for conquering wherever they carried their arms. . . . Upon the whole, such were their strength and courage, wherever they entered into an offensive or defensive war, that, as Thucydides himself tells us, no nation, either in Europe or Asia, could equal them for strength, valour, or conduct; nor could anything resist their power, when they were unanimous among themselves. Such care they took to cultivate this martial genius, that even their own women were inured to it betimes, insomuch that no woman would be admitted into matrimony till she had killed at least one enemy with her own hands. . . .

"They were remarkable for their fidelity and friendships, which they esteemed and gloried in above all things; . . . and when such a friendship was once contracted, there was no danger or death which they would not expose themselves to for one another. . . .

"We are told that very few of them died in sickness, but that in general they lived to a good old age. Their women are affirmed to have been so well trained to riding and shooting that they did not fall short of the men in those exercises.

"In their excursions they carried with them a certain composition, in small pieces like pills, one of which, upon occasion, would afford sufficient nourishment for several days. Pliny adds (A.D. 60—115) that they used the like expedient with their horses, by means of what he calls the Scythian Weed, upon the strength of which they

could travel ten or twelve days without eating or drinking."

Here we have a nation valorous, vigorous, and virtuous; faithful friends and fearless warriors—men and women alike, and, more wonderful still, not altogether ignorant of compressed foods and drugs. We do not maintain that Ambidexterity was exclusively responsible for this marvellous efficiency, but that this people were Ambidextrous by law and practice is clear from the history, hence what is the reasonable conclusion? It is surely more than a mere coincidence.

Coming down to our own times, we have an equally conspicuous example of the coincident existence of extraordinary manual dexterity and phenomenal national activity and development.

We turn our eyes again to the Far East, and in Japan is found a people who are Ambidextrous above all others. From time immemorial they have taught it in their art schools, or practised it in their lives, with the result that they are truly bimanous practically as well as anatomically.

That the Japanese stand at the very head of civilized nations will be conceded readily by every one, but it is not equally widely known that they are the most Ambidextrous people upon earth. They have been two-handed from the remotest antiquity, and it speaks eloquently for the cult that they have also been in the van of progress in science and art for many years past.

They are indeed a wonderful race, and in the present war they have proved themselves as distinguished in military prowess as they have been for centuries for artistic pre-eminence. Sir Rutherford Alcock tells us that:—"It is not too much to say that no nation in ancient or modern times has been richer in art-motifs and original types than the Japanese.

"When the London exhibition of 1862, therefore, made its display in the 'Japanese Court,' the rich treasures of art work came upon Europe as a new revelation in

decorative and industrial arts, and have continued since to exercise a strong and abiding influence on all industrial art work.

"Such is the delicacy of touch and skill in manipulation exhibited by Japanese workmen of all kinds, that, apart from the general principles applied in all decorative processes, the simplest piece of constructive workmanship is not easily rivalled, or in danger of being mistaken for the work of any other than Japanese hands.

"Their ingenuity and taste in pottery excite the envy and admiration of Europe, and to this day many secrets of these crafts of pottery and porcelain are as jealously guarded as ever.

"The beauty and excellence of Japanese lacquer ware have never been matched in Europe. Japan reigns supreme, now as at first, in this, the most beautiful and perfect product of all her skilled labour and artistic power. It will hardly be believed that some of these specimens fetch their 'weight in gold'!

"In all manipulations of metals and amalgams the Japanese are great masters. They not only 'are in possession of secret processes unknown to workmen in Europe,' by which they produce effects beyond the reach of the latter, but show a mastery of their material which imparts a peculiar freedom and grace to their best work."

In carving, decoration of wall-papers, and textile fabrics they have never been surpassed, whilst "their embroidery has never been excelled in beauty of design, assortment of colours, and perfection of needlework."

Another distinguishing trait or feature in Ambidextral Japanese life and history is that "a very large proportion of the best writings of the best age of Japanese literature is the work of women; and the names of numerous poetesses and authoresses are quoted with admiration even at the present time."

Moreover, it is no less a fact that this nation has been

famous for its knowledge of medicine for over a thousand years. They are well abreast of the times now as regards medical science, for the Press universal is loud in its praise of the efficiency of the hospital arrangements at the seat of war in Korea. But even in the eighth century a University had already been established in Japan that included such chairs as Ethics, Mathematics, History, and Medicine; and some of the text-books employed at that remote period dealt with such subjects as the diseases of women, materia medica, and veterinary surgery. Text-books treating of these branches of science were not known in Europe until centuries later.

There is no wish to press this point of Japanese two-handedness too far, to misrepresent or exaggerate their Ambidextral powers, or to draw unfair deductions from history; but facts cannot be ignored, and whether those facts be put down as coincidences or as true cause and effect must be left to the judgment of the reader.

So far, then, as the Japanese are concerned, and leaving entirely aside their education and their reputed Ambidexterity, we have here a nation pre-eminent in all artistic productions, in every possible kind of handicraft, in all manipulative workmanship, in short, in all hand-culture; a people amongst whom each single individual is distinguished for manual skill, for delicacy of touch, and unrivalled execution. This on the one side; and on the other a nation whose adoption of Western methods, ideas, and valuable processes has been little short of marvellous, and whose military prowess and position to-day compel us to recognize in her one of the most advanced and powerful of all civilized peoples!

Such, then, are the modern developments of Ambidextral Culture, and if pre-eminence in science, art, military prowess, strategy, and sexual equality are the inseparable concomitants thereof, surely the sooner we adopt it the better for us all!

Finally, there is one feature of the controversy that I

must specially emphasize, a feature that clenches the argument once for all and irrevocably, and that is the testimony of the only truly competent judges of the real value of Ambidextral skill, viz. those who have actually possessed that faculty and practised it in their lives for nearly all purposes. Their evidence is absolutely unanimous! These Ambidexters declare that their two-handed skill is of the utmost service to them; that in no single instance is it ever other than an advantage and a benefit to have two right hands; that never does the sinistral dexterity interfere with or in any way militate against the dextral aptitude and perfection of development, nay more, as we have seen, it rather increases and intensifies it; and that they are unable to imagine a case where Ambidexterity would not be far superior to Unidexterity in whatever work the hands might be employed.

Ambidexterity is represented by such names as Leonardo da Vinci, Holbein, Landseer, Queen Victoria, Baden-Powell, and Sir Daniel Wilson, the last of whom, after nearly eighty years of Ambidextral experience as a highly developed two-hander, sums up the discussion in the following forcible words:—

"Experience shows that wherever the early and persistent cultivation of the full use of both hands has been carried out, the result is greater efficiency, **without any counterbalancing defect.** We are Bimanous in the best sense, and are meant to have the free, unrestrained use of both hands. . . . The experience of every thoroughly left-handed person shows the possibility of training both hands to a capacity for responding to the mind with promptness and skill."

What, then, is the conclusion of the whole matter? No competent authority has been found to deny that "much more could be made of the left side by careful cultivation." If this be the fact, then that screaming sentimentality which declares Ambidexterity to be a dangerous revolution,

likely to bring in a reign of chaos and confusion throughout the domain of settled manners and customs, may be quietly ignored; whilst the "audacious ignorance" which, in a perfect deluge of denunciation, INFORMS us that "Ambidexters have set themselves to counteract a natural tendency," that "they must reconstitute the whole order of things," and that we are made so lopsided by nature and by physiological conformation that it is impossible for "a man who tries to put on and button up a woman's waterproof, or a woman who attempts to don and fasten a man's overcoat" to do it with any amount of ability or readiness, may be dismissed with a smile of supreme contempt.

It has been more or less clearly shown that the advantages of Ambidexterity are many and great, mentally, morally, and physically—equally to the individual and to the nation; that the effective strength of a person and of a people is increased from 30 to 50 per cent.; and that this Educational Reformation, which is here and now proposed to be carried into effect, can be accepted, adopted, and accomplished throughout the British Empire without the expenditure of either money or men, and in the short space of a few months at the farthest.

Is it not incumbent upon us as a civilized and enlightened people to extend these advantages to our children in the most expeditious and efficient manner possible, and thus secure to the generations following a heritage of superior vigour, valour, and virtue that shall raise them many degrees higher in prestige and power than they would otherwise be?

The most sanguine advocate of Ambidexterity does not expect that a universal two-handedness would make this earth a heaven, or its inhabitants angels; but that it would make the earth less unlike heaven, and its people fitter associates for the angels, there is abundant evidence to show.

CHAPTER VII

OBJECTIONS TO AMBIDEXTERITY

THAT every proposed innovation, however desirable and excellent, will meet with some degree of opposition, of whatever kind it may be, goes without saying; hence it is not surprising to find that there have been certain objections raised, and urged with divers degrees of emphasis, against the scheme of Ambidextral Culture advocated in these pages, and inculcated by the newly formed Society elsewhere referred to.

It can truly be said that all the objections hitherto advanced have been either speculative or illogical on the one hand, or else frivolous and vexatious on the other. Candidly speaking, we have not encountered one single serious, sensible, or even plausible objection to two-handedness in the whole range of the controversy.

If it were not that some of these protests come from those who are supposed to have considerable acquaintance with the subjects of medicine and education, and who therefore might be expected to be reliable authorities on the question at issue, they could be dismissed without comment, so utterly devoid are they of any foundation in logic, in practice, or in fact.

For instance, a well-known inspector remarked the other day, "I don't believe in teaching a child to use both hands simultaneously. Much better teach the right hand first, and then, **if there is time,** educate the left also." Surely no one who had given the least thought to the question could have made such a random statement!

On general lines and principles we might just as wisely propose to teach one eye to see first, one ear to hear first, one hand to play the piano first, and one foot to walk first, before we teach the other eye, the other ear, the other hand, or the other foot. Besides, the phrase "if there is time" is most unfortunate in two senses, neither of which was appreciated or, and much less, intended, by the speaker: First, it betrays an indifference to, or ignorance of, the whole question of Ambidextral instruction; and second, it declares his belief that the Bimanual training will take up more time than the one-handed course at present requires. A writer in "All the Year Round" falls into exactly the same error when he says:—"To teach a child to do all these things with both hands would take nearly, if not quite, twice as long as with one hand only."

Why will speakers and writers commit themselves to such rash and hasty opinions? This "TIME" objection has been disproved in the every-day experience and practice of numerous teachers over and over again. Indeed it has been established as an invariable fact, that two-handed development is much more rapid in its progress than one-handed education has ever been. Hence as a typical case, the two hands in pianoforte-playing receive exactly the same amount of attention, **simultaneously** from the very first exercise and lessons. In any case, our objectors go contrary to common usage, which is, to have first a general education, and then specialize and differentiate according to powers, talents and tendencies. Here, however, the specializing is rendered a superfluity because with Ambidextral education both hands will be so perfectly developed in sensitiveness and expertness that no further advance will be possible. Some writers who have very pronounced views on the **inestimable advantages of possessing a crippled or sinistral hand!** DO NOT HESITATE TO ADVANCE THE MOST PUERILE ARGUMENTS AND THE MOST EXAGGERATED

STATEMENTS in support of their contentions. For example, one of them says that—"the buttons of our dress, and the hooks and eyes of all female attire, are expressly adapted to the right hand"!! This is incorrect, for is there a man amongst us who cannot, AND WHO DOES NOT, button his dress with either hand and with both hands continually? And similarly with women, who are still more deft in buttoning and hooking their manifold attire! But even granting the assumption to be true, it is an incontrovertible fact that IN COUNTLESS CASES THE BUTTONING IS EFFECTED JUST AS EASILY AND AS SKILFULLY WITH THE LEFT HAND, and never does it show less aptitude for the work than does the right hand itself. These critics might as well tell us that violins are made to be fingered specially and exclusively by the left hand, because the right hand would be unable to execute the difficult manipulation,—and we should be quite as ready to believe them! As Sir Daniel Wilson observes:—"Habit so entirely accustoms the left-handed man to the requisite action, that he would be no less put out by the sudden reversal of the door-handle, knife-blade, or screw, or the transposition of the buttons of his dress, than the right-handed man."

Mr. James Shaw, writing in "Knowledge," objects to Ambidexterity on the following grounds, and he also denies its advantages:—"It is argued by some writers that it would be a great advantage were we Ambidextrous, using both hands with like skill. Now no one doubts that the specialization of hands for the purpose of grasping, and feet for locomotion, is of more advantage to man than if he had four hands fitted for both functions. As the child grows older the difference of both hands appears, and this difference in civilized countries is eagerly helped by precept and example.

"As in playing whist it is better that partner should have many trump cards, and self few, than that each should have an average number, So it is found that in a

world where time is so valuable, where art is long and life is short, it is better one hand should be very well educated, and the other comparatively neglected, than that each should have a moderate aptitude. Gimlets, screws, scissors, scythes, &c., are all made for the right hand. He who would educate us to the Ambidexter must have two handles to every door, two methods of winding up every watch, Janus-shaped benches, gauges, and duplicate sets of screw-nails, scissors and scythes."

Mr. Shaw, curiously enough, goes on to say:—"Not only is the right hand the most dextrous, there is also a difference in the strength of vision in the right and left eye. In many cases this difference is so great as to necessitate the sufferer" (or "lopsided person," as Mr. Shaw facetiously calls him) "having the lenses of his glasses specially suited to each eye. The advantage of such an arrangement is obvious; indeed the relief in reading given to such an individual, when he has got a lens suited to either eye, IS SO GREAT THAT WHEN ONCE DISCOVERED IT IS NEVER FORGOTTEN"!!

Carefully examining this mixed medley of gratuitous assumptions, false premises, and almost foolish conclusions, one is struck with amazement that a writer who exhibits in other parts of his paper undoubted ability, should commit himself to such a jumble of absurdities, and evidently in serious argument.

His first position is untenable to begin with; for surely no one could or would object to have not only ONE extra faculty, but several, IF he had the opportunity of acquiring them. What could any individual **lose** by **gaining** an additional power or endowment, be it mental or physical, except indeed a certain amount of **dis**ability and gaucherie? Supposing, for example, that our eyes and ears were, all four of them, equally capable of both hearing and sight, where would the inferiority or the disability come in? And taking his own case, How, we ask, could the possession of FOUR LIMBS, say hands, ALL EQUALLY

ADAPTED FOR BOTH PREHENSILE AND LOCOMOTIVE MOVEMENTS, be considered a disadvantage? For the contention is not, that therefore our hands would be less dextrous, sensitive, responsive, or useful than they are under present conditions, but that our two feet would be made so much more useful than they now are! In Mr. Shaw's own words, we confidently assert that "NO ONE DOUBTS" that the more faculties, endowments and powers our limbs can exercise, the better and the more advantageous it must be for the fortunate owners. Even in the case where some or several of these powers may lie dormant, it cannot be detrimental in the least degree to have them so. But to be precise in our criticism :—

1. Mr. Shaw begs the question when he assumes that there is to be any "MODERATE APTITUDE" in the matter at all. Ambidexterity does not mean **two left hands** —no one, save possibly himself, has ever contemplated making people AMBISINISTROUS!!—it means **two right hands**. There is no intention of reversing the present order of things and educating the left hand whilst neglecting the right; our purpose is the rather to educate the left hand to an equality with the right, and the supposition that with bimanual instruction both hands would only attain to a MODERATE APTITUDE IS NOT ONLY UNFOUNDED, BUT POSITIVELY CONTRARY TO EXPERIENCE AND FACT. In no one case out of many thousands is it true that the two hands become less expert by simultaneous cultivation and development, than does one hand when trained and educated alone. Nay, the reverse is the case, for, as is seen elsewhere, teachers find that both hands simultaneously taught become more dextrous than either hand could ever become if subjected to separate and independent treatment.

2. His inference that the one hand could never attain to its full individual development if HAMPERED (!) with an equally dextrous fellow, instead of being united to an awkward, crippled, and comparatively helpless partner,

is likewise chimerical, and opposed alike to both common sense, common custom, and common experience. Does the cultivation of the left hand in pianoforte-playing interfere in the slightest degree with the most perfect development of the right hand? Has it ever been known that the right hand has suffered by any training that the left hand has received, in even one occupation or exercise? If so, there is no record of the fact; but the contrary is well known to be the universal result.

3. The idea that "every door must have two handles" is so purely fanciful and gratuitous as hardly to be considered as intended. For in the existing state of things, are not doors opened just as freely and almost as frequently with the left hand as with the right? And where does the dextral advantage of our present door-handles come in? We have yet to learn that they have been, are, or ever will be, made for one hand, and that hand the right! And if the door with one round handle (or square or flat handle for the matter of that) is sufficient to meet the needs of a one-handed person, it is obviously absurd to imagine that a two-handed expert would require still more accommodation. The **natural** inference is that he would require, if anything, a good deal less. Similarly with watches, &c.

4. Again, the argument that duplicate sets of tools gimlets, scissors, scythes and so on—would be necessary proves nothing against, but only in favour of, the adoption of Ambidexterity. For, take the scythe as an illustration. What a boon to mowers it would be if after half a morning's work with the one tool and side, they could change to a second scythe and thus exercise the other side of their bodies. Even were this advantage discounted to its lowest value, it could not be other than an important one. Let it nevertheless be remarked here, that of all the innumerable tools at present in use amongst artizans and mechanics, a very trifling proportion of them would need duplication or alteration for sinistral use; e.g. neither

the hammer, saw, plane, axe, drill, chisel, mallet, pincers, gauge, brace, screwdriver, file, nor even the gimlet of necessity, would require any duplication; and these are nearly the whole equipment of the carpenter's tool-bag.

Moreover, it is not a necessary result, nor is it indeed a probable effect of Ambidexterity, that any single one of the ordinary customs, habits, or observances of life should be reversed or interfered with. All of them, however, would certainly be advantaged by the supplemental and alternative aid afforded by the acquisition of an extra assistant or workman, efficient, skilled and competent to perform every office and function in the event of accident to, or disability of, the dexter hand.

As an illustration, is it not a fact that a left-handed carpenter is—from his inevitable two-handed aptitude—not merely as dextrous as his right-handed brother, and can use the plane, the saw, the chisel, the hammer, and all other tools, quite as easily and as cleverly; but that in many a peculiar situation his partial Ambidexterity comes in with an amazing convenience and profit? Let any one watch, as the writer has done frequently, the left and right handed carpenter, and all ideas of inferiority hitherto associated with two-handedness will for ever disappear.

Another class of objections relates to the mental or psychological effects; and some medical men have expressed themselves as **fearing** that "the extra labour thus imposed upon the brain will endanger the intellectual and mental standard of the individual." Surely this is a false conclusion; or if the conclusion be right, then the premises must be wrong. Ambidextral instruction does not entail extra work upon the brain, but rather distributes the work to be done over a double area of brain matter. Instead, therefore, of one side or hemisphere of the brain having all the work to do, and the other lobe or hemisphere becoming atrophied through disuse, both sides are alternately or simultaneously and symmetrically engaged, exercised, and developed in the educative stages, and

ultimately, in adult life, each half takes its own proper share of the daily task; and thus each lobe is proportionately benefited by this natural, this wise and happy division of labour. Here, once more, the objections to Ambidexterity are unmistakably converted into a vital and powerful argument for the introduction and compulsory adoption of two-handedness, to supersede the present lopsided one-handed instruction.

The suggestion raised in a previous page, that the education of the pupil will thus be unduly extended (or at the least materially lengthened) is based on the assumption that to train both hands simultaneously for all occupations is a more difficult and tedious undertaking than to train one only, and that the dextral member. Professor Tadd, after an experience of twelve years of Ambidextral teaching, claims, as we have already seen, better and **more** work in the same space of time from both hands taught and engaged simultaneously, and educated equally, than when one hand is trained and cultivated separately. So that the period of school life—for the same standard of efficiency—will be, and is, materially lessened, instead of, as imagined by our objectors, being at all extended.

Those persons who entertain the opinion that right-handedness is ordained by the Creator, and that to inculcate the teaching of Ambidexterity is to "fly in the face of Providence," and turn the laws of Nature upside down, may be permitted to indulge their far-fetched and harmless theory in peace and quiet. They are not numerous as a body, and the Bible, which may be supposed to constitute their sole authority, does not afford one solitary fact, command, or exhortation in support of such an obvious misapprehension. We might, however, again remind those objectors that in the Old Testament, mention is made of a very fine body of left-handed soldiers, 700 in number, who formed a very important factor in the army of the nation, and whose dexterity was so excep-

tional that it is stated they could "sling a stone to a hair's breadth," thus outvying in skill any of the right-handed warriors of the time. Moreover, there is no record of these men being condemned as sinners exceedingly above their fellows, nor of their incurring the Divine displeasure because of their most unusual, but sinistral, prowess.

Some people are afraid that the introduction of Ambidexterity and two-handedness will involve the whole fabric of society in one hopeless chaos of confusion. The left hand will be continually usurping the functions of the right, and in critical moments the indecision as to which hand shall be used will probably often result in fatal consequences to the victims of this bimanual craze!! Alas! for the authors of this objection, for on examination it proves to be a strong argument in favour of the proposed innovation; because, if we appeal in the first place to common sense, does it not stand to reason that in any emergency and in every critical moment where skilled manipulation is demanded, the advantage must rest with those who are provided with two dextrous hands, rather than with those who only possess one, the other being, to all intents and purposes, a burden, a hindrance, or, at the best, an unreliable help? Take an analogous case in football. Is not the Association player's efficiency measured by his expertness with BOTH feet? How often would he utterly fail in dribbling, passing, and shooting at goal, were his left foot not as quick and as clever as his right? But there is another and even better answer to this objection, viz. the already admitted fact that with the great majority, the very large majority, of human beings, one hand will always be slightly superior, so that the Ambidexter will never be at a loss which member to use at critical moments; or, where either hand could be used with identical advantage, the preferential use of one hand will invariably save him from indecision and, hence, from danger. Again, where there exists perfect

Ambidexterity, or even practical Bimanual skill, there will be as much and as perfect an instinctive use of the preferential hand, i.e. the most appropriate hand—in every emergency, as there is a natural impulse, under normal one-handed conditions, to use the right or dexter hand on all such occasions, WHETHER WE CAN DO SO WITH ADVANTAGE TO OURSELVES OR NOT!!

The very realization of the fact that one has two fully-qualified and equally efficient members, each similarly capable of performing every required duty, and of responding to every demand that may be made upon them, is sufficient to inspire the happy possessor of such an accomplishment with a confidence otherwise wholly unattainable, whilst it surely invests him with a reserve of power of the highest possible value in every condition in life. Moreover, reasoning by analogy, it is never found that, in the animal world, the possession of two equally strong and effective wings, of two feet, or—as with monkeys—two hands equally and identically endowed with natural powers, causes any uncertainty, confusion, inconvenience, or awkwardness. How often indeed have we all admired the wondrous agility of the quadrumana, as we observed their springing and swinging from branch to branch in their marvellous gambols and aerial flights!

The tiger or cat will catch its prey with either paw, and will climb equally cleverly with both; the squirrel likewise shows no preference for, or superiority in either foot,—and so on through the whole range of the various orders; and we may therefore warrantably conclude that a bimanous race of human beings will be just as superior to a one-handed people as the present bimanous and perfectly Ambidextrous monkeys are, or would be, to a one-handed species of ape—for example—did such a species exist. Where indeed would such a lopsided species come in, and how could they survive in the struggle for existence? If a law of the "survival of the fittest" actually obtains, such an obviously inferior tribe

of monkeys would speedily vanish. The danger now being discussed, therefore, is a purely imaginary one; the idea that the left hand would ever usurp or interfere with the functions of the right hand being as groundless as it is unnatural and impossible.

With reference to existing established customs and usages of society, such as shaking hands, carving, there need be no anxiety. Ambidexterity is not meant, and will do nothing, to disturb those manners and observances any more than the knowledge of other languages disturbs or interferes with the use of the mother tongue. Unfortunately for the critics under review, they seem far more concerned to discover bogus, and utterly contemptible, faults than they are to recognize—much less to acknowledge—undoubted merits; hence the accumulation of what we are compelled to regard as frivolous and vexatious objections which do not militate in the slightest degree against the great and grand principles of the proposed innovation in our national education which are set forth in the pages of this Manual.

A distinguished medical professor writes as follows:—"Believing, as I do, that the left brain and the right hand are designed by nature to be dominant, I cannot approve of Ambidextral culture. We recognize that it is only in left-brained and right-handed people that the highest developments are possible . . . this undeniable fact. If your intention is simply to advance such a degree of left-handed education as will render the right brain and the left hand, so to speak, understudies for their corresponding parts, I shall wish you every success in your efforts."

Here are three statements; the first and third are strangely incongruous, and still perfectly harmonious. An "Understudy," it must be remembered, is not necessarily an "Inferior," but simply "An Actor" (the right brain, for example) "who studies a part allotted to another performer" (the left lobe or brain in this instance), "so as to

be ready to undertake it in case of necessity;" or as another definition gives it, "an actor who prepares a part so as to be able to **take the place of the actor playing it**, if necessary." Precisely, and this is exactly what simultaneous two-handed work and Ambidextral culture generally provide for; that whilst the right hand and left brain shall, by custom and habit—and, if you will, by preference—be the playing actor, and the leading actor too—the left hand and the right brain shall so study the part, and shall be so educated to perform the part, that at any time, and at all times whenever necessary, either from inconvenience, fatigue, indisposition, or other cause in the dominant or principal actor, it shall be fully qualified to sustain the part devolving upon it, discharging all the functions, duties, and responsibilities with equal ability, accuracy, certainty, and satisfaction. Most unhesitatingly, then, we say to this objector, we accept your condition without qualification. Make the right brain and the left hand "Understudies" to their corresponding parts, and we are quite willing to leave the allocation of their respective obligations, and the share each pair shall take in the ordinary concerns of life in all its manifold avocations, to the dictates of common sense and the demands of the situation.

The second statement is one of the most serious we have yet encountered, and we cannot afford to let it pass without the most rigid and searching inquiry. The Doctor says it is an "Undeniable Fact" that "it is only in left-brained and right-handed people that the highest developments are possible."

We should like to know what the Doctor means by "the Highest Developments." Does he mean that Solomon, that Samson, that Luther, that Newton, that Bacon, that Queen Elizabeth, that Morphy, that Paganini, that Paderewski, that Handel, Grace, and Roberts, and pre-eminently Leonardo da Vinci (a strange grouping of characters surely), were all pronouncedly right-handed

individuals with predominant Right hands and Left brains, and that they could never, and would never, have reached such a pinnacle of superiority in Wisdom, Strength, Courage, Science, Philosophy, Knowledge, Diplomacy, Music, Chess, Technique, Cricket, Billiards, unless they had possessed this one great qualifying attribute of right-handedness? Or does he mean, still more universally, that the individual is never capable of a "Highest Development" unless nature has endowed him with a dominant left brain and therefore a similarly dominant right hand; in which case the unfortunate left-handed and right-brained individual is left out in the cold, and the 80 per cent. of normal-type persons can never hope to rise to any great eminence, but must rest content with an inglorious mediocrity to the end of their days?

Again, does the Doctor mean by "Highest Development," brain growth or culture **only**, or does the phrase apply to every department of a man's being and personality; to the muscular strength of the modern athlete, to the wonderful automatic agility of the pianist, to the amazing shooting accuracy of the king's prize winner, to the incredibly delicate and unerring certainty of the champion billiard-player, as well as to the mental developments of a senior wrangler?

As already remarked, this dictum is a very serious one to make unless there is irrefragable evidence in the form of incontrovertible facts to support it. We know that it has recently been said in an unofficial paper that "Scientists further conclude that right-handedness is natural, and its superiority over the left hand increases with growth. The brightest pupils are, so to speak, more right-handed than the others. It is a general opinion that criminals have not only more left-handed people among them, but they are also more expert with both hands than people in general."

In reply to the first statement that right-handedness is natural, Chapter III. has given facts which finally and fully

prove the contrary; that "its superiority over the left hand increases with growth" has been shown to be inevitable only when education represses the left hand and cultivates the right. As to the "brightest pupils" being the most strongly right-handed, we have no statistics to support such a statement; and that "criminals are more expert with both hands than people in general" is not only contradicted by good authorities, but, even if true, only proves that they see the advantage of two dextrous hands and avail themselves of it; their more respectable and virtuous fellows being too much blinded and biassed by tradition and custom to perceive or to admit it. For it is not the Ambidexterity that makes the criminal, for, if so, it makes a Baden-Powell, a Paderewski, and a Cinquevalli; a Landseer or a Morse. Two-handedness has no such absolute power over a man's conscience or his moral sensibilities. It will, however, render the man, be he vicious or virtuous, a greater potency for evil or good in the world; but it is just as foolish and just as groundless to say that hand-culture is immoral in its tendencies as it is to say that brain-culture is vicious in its influences. Indeed the monstrous absurdity of the whole assumption is too appalling, viz. that the cleverer you make a man, the more criminal you make him. And if insane people and criminals (who are generally of the uneducated classes) have a great percentage of partial Ambidexters in their ranks, it only emphatically proves that where man or nature is left alone, or not subject to the repressive force of custom, education, and tradition, the **natural and instinctive advantage of a perfect two-handedness** reasserts itself with much greater frequency, fulness, and freedom, than obtains amongst his more civilized *confrères*.

Looking at all these statements generally, it may be rejoined that it is very easy and very safe to institute such contrasts and comparisons, for the simple reason that it is **practically** an impossibility that Solomon, Samson,

Newton, Bacon, Luther, Paganini, Morphy—kings in their respective realms—and such like should have been anything else but right-handed, when the sternest discipline, the most inexorable tradition, the most rigid custom and the most systematic education, combined from the earliest period even until now, to cultivate their right hands and to cripple their left! Nevertheless, we have just as easy, just as safe, and an equally potent reply, for we fearlessly assert that but for this lopsided policy, but for this disciplinary and drastic crippling of the left hand, ALL those great worthies, whose names are household words, would have surpassed their recorded excellences to a wonderful extent, and that—if two-handedness does elevate and improve and advantage the individual, as Chapter VI. clearly proves is the case—had those notables been privileged to receive an Ambidextrous education, they would have reached a pinnacle of greatness 30 to 40 per cent. higher than what their defective one-sided training attained. We can always fluently declaim against and denounce what we are ignorant of, and it has been the universal practice since Adam's time to do so. Man will not learn the lesson that 10,000 mistakes of his ancestors should have taught him, and reserve his judgment until he hears, sees, and understands both sides; and a glance at the eleven or twelve conflicting theories regarding right-handedness that have been put forward in recent years (see Chapter III.) will abundantly confirm this statement in so far as it relates to the present subject.

We are making most comprehensive investigations in both the Education, the Insane, and the Criminal Departments, the results of which inquiries we hope to be able to supply before this Manual goes to press; but as a CONCLUSIVE and INCLUSIVE reply to ALL and EVERY objection that has been brought or ever will be brought against two-handedness, WE DECLARE, that if to the mountain-climber Ambidexterity is essential in the hand

grip for the prevention of fatal accidents—and we are told that it is; if to the cyclist two-handed dexterity is an indispensable acquisition—and who doubts it? if to the pianist and organist it is the secret of ANY and ALL success—which it obviously is; if to the cricketer it adds 30 to 50 per cent. of efficiency in the field—what sportsman denies it? if to the sabreur Ambidexterity affords the most undoubted advantage—which is everywhere acknowledged; if to the surgeon bimanual skill is vital to the success of many an operation—and the profession universally admits it is; if in these and a hundred other professions, occupations and recreations, the possession of two equally dextrous hands is a boon, a blessing, an essential faculty,—WHY, we demand with all boldness, WHY should not the possession of two equally dextrous hands for EVERY function, and in EVERY individual, be even still more desirable and still more advantageous? If in these related, and the hundred other, occupations referred to, the Ambidexters not only attain to what one may fairly conclude to be in general language the "Highest Developments," but also remain absolutely free from vicious contaminations, immoral tendencies, or criminal propensities,—what reason, fact, or evidence is there for supposing that a systematic course of bimanual culture will do other than raise the standard of physical excellence in the individual, and in the community through the individual?

Lastly, we have the fulmination of Dr. Gould,[1] who at great length and with equal vigour, tries to show that "All attempts at Ambidexterity" are injurious! His denunciation is couched in the most uncompromising language, and he clenches his argument by the citation of an illustrative case, out of "many instances in proof" which he says he could produce.

He avers that Ambidexterity is not "desirable"; that

[1] "Popular Science Monthly," August, 1904.

all attempts to "bring it about" have "bad results"; that they are "unwise"; that they "result in suffering and disease," or in "life-long cruelty to the left-handed," or in "confusions and indecisions during the entire subsequent life," or in "life-long obstacles to progress," or in "disease and life-failure"; that such attempts are "most pathetic"; and finally that "the best consequences are poor"! We quote one extract in full to exhibit the Doctor's case fairly, but we take our accustomed liberty of emphasizing in heavier type one or two phrases therein for the reader's benefit.

"I have never seen anything but bad results from THE ATTEMPT TO TRAIN CHILDREN TO USE THE RIGHT HAND INSTEAD OF THE LEFT, **when there is a decided tendency or habit to be left-handed. Moreover the attempt is never successful. The best consequences are poor**, and are only awkward mixtures of the two forms, which yield confusions and indecisions during the entire subsequent life. I could cite many instances in proof, some of them most pathetic, in which disease and life-failure resulted."

Then follows the illustrative case, detailing the dire effects of this awful Ambidextral effort:—A friend of his, who, when a boy—naturally left-handed—was compelled for years, "by arduous and continued training to write with his right hand **and not with 'his left'"!!**

Can the learned Doctor be serious when he concludes his description of this pathetic and convincing case by saying, "**The attempt at Ambidexterity** has been a life-long obstacle in his professional progress"?

Here is a boy with a strongly developed sinistral bias, or naturally left-handed, and because his parents were so blind and foolish as to repress that bias, to try and destroy it, and to make him write with his right hand INSTEAD OF WITH HIS LEFT—that is, to keep him still ONE-handed—the Doctor throws all the blame on the faculty of TWO-HANDEDNESS and on the Society that has been

founded for the purpose of promulgating the principles of Ambidexterity or EQUAL-HANDEDNESS! The scheme advocated in these pages and in the constitution of the Society aforesaid, is to raise the aptitude, to increase the expertness of the sinister hand—whichever that may be—to an equality with the dextral one, so that the two may be in all respects similarly proficient in all exercises; and further to strongly deprecate every and any endeavour to suppress, or interfere with, any such natural one-handed bias or pre-eminence as Dr. Gould's friend undoubtedly possessed.

Is it not clear that it was not an attempt at either dextral or ambidextral culture that injured the boy? it was drastic interference with, and cruel suppression of, his unusual sinistral bias and powers. How can the attempt to force children to use one hand INSTEAD OF THE OTHER be twisted into an attempt at Ambidexterity?

And what, then, shall be said of this mournfully long list of indictments against two-handed training? Are they not all frivolous and vexatious, and worse? They do not deserve the most cursory notice.

Take the case of an ordinary or of an extraordinary boy, say of five years of age, to represent the millions of such juveniles the world over. An attempt to make him Ambidextrous is first tried with the piano, and he acquires great dexterity, and Ambidexterity, on the keyboard; **does he suffer from disease thereby?**

He is also taught the violin, and becomes most expert on that instrument, indeed his left hand has the superior task and proves quite equal to it; **has the boy started on his return journey to barbarism?**

He likewise takes up cricket, and grows equally clever with both hands in catching, throwing, and even in bowling and batting; **does he groan under a life-long cruelty?**

Furthermore the youth now develops a remarkable power or fancy, and he practises both writing and

drawing with both hands until he becomes absolutely as dextrous in those occupations with one hand as with the other, for he can scribble and sketch with equal "expertness, accuracy, and rapidity" with both hands; **is he a "pitiable victim" to "life-long confusions and indecisions," and to absolute life-failure?**

Dr. Gould stakes his reputation on an unqualified affirmative reply to these four questions!

Let us follow this youth in his future career, who has made so very many attempts to be Ambidextrous, for in the present case it must be allowed that they are *bonâ-fide* efforts to become truly two-handed. And what is the ultimate result? He leaves school, this emaciated victim; he manages to crawl through the University, or Sandhurst, or the studio, and to survive many years of arduous toil as an Ambidexter in those centres of instruction and art. He enters the arena of life's contest, and we recognize a Leonardo da Vinci, Holbein, Landseer, Sir Daniel Wilson, Professor Morse, and a Baden-Powell; or we see a Paganini, a Paderewski and a Chopin, and so on, *ad infinitum !!* Are these "Life-failures"?

The world is full of notables who are three parts Ambidextrous: indeed, may we not say the more Ambidextrous they are the more celebrated, the more ambitious, and the more successful they are? It is in trade and commerce just the same; the more Ambidextrous the workman is, the more efficient and valuable he is, no matter what the vocation may be.

Dr. Gould forgets that there are genuine, earnest attempts at Ambidexterity being made every day and every hour by millions of tender scholars, and by tens of thousands of plodding, persevering students in the fields of music, art, science, surgery, crafts, sports, and games; but where do we find in ONE of those departments of work the pitiable creatures writhing under all those terrible afflictions so graphically described by him?

To the best of our knowledge we have examined every

objection that has been brought against the Ambidextral Cult, and until these opponents discover something more tangible to offer than such baseless conjectures and gratuitous assumptions it is our plain duty to employ our time and talents in perfecting ourselves in the use of the limbs and organs with which we have been endowed.

CHAPTER VIII

THE PHILOSOPHY OF SIMULTANEOUS MOVEMENT

An inevitable and natural outcome of Ambidextral culture is simultaneous two-handed work. The instinctive impulse of a skilled Ambidexter is to attempt the performance of two things at a time; and even with one-handed individuals (by this term we mean, of course, persons having two hands, but only one of them trained to the highest degree of skill) there is frequently, if not indeed very widely, a strong inclination to exercise both hands concurrently in totally different and unrelated duties, which demand equally distinct and dissimilar movements.

The development to which we refer has taken the form of dual concurrent penmanship and drawing at school, not only in copy-books of different copies and models, but of totally independent and original matter, such as the writing of two letters to two individuals at the same time, drawing with one hand and writing with the other; writing with either hand and working arithmetical questions with the other, and all simultaneously.

Now this novel phenomenon has not only taken every one by surprise, it has done more; it has roused in the minds of some very few critics a fear that evil results will follow, and they have expressed not a little alarm at, and advanced protests of by no means a feeble nature against, such a dangerous (!) and, as they consider it, useless innovation. We hasten to assure these objectors that there is not the slightest cause for the least apprehension,

as we hope to show in the following argument; but it is not the less surprising that, with such startling and convincing evidence all round them, they should have thought it necessary to utter one word of warning where the amount of danger to be guarded against is obviously below zero!

It may be advisable to briefly define the actual position and to clear away every vestige of uncertainty as to what is herein advocated regarding the whole question of simultaneous two-handed culture and work.

We contend that it is our bounden duty as parents, governors, and teachers to insist that our children are systematically taught from infancy to be truly two-handed; that this system of Ambidextral culture shall include daily instruction in simultaneous exercises of an easy, but of a graduated and increasingly difficult nature; that no preference shall be shown to either hand in the respective occupations, movements and functions prescribed, but that both shall receive similar care; that the grand object of this scheme of bimanual training is to render each hand absolutely independent of its fellow in all manual actions, but also equally capable of uniting harmoniously and perfectly in concerted and the same work; and, finally, that children thus symmetrically developed, with two equally skilful hands and two equally organized brains, will certainly be superior to their unidextrous fellows in every respect.

The propositions that we will proceed to establish with reference to this question are as follow:—First, That it is possible to do two things well at the same time, and that every ordinarily intelligent child is capable of becoming as expert in the performance of two concurrent and unrelated acts as he can be in the separate accomplishment of one. Second, that the acts which we thus designate as concurrent or simultaneous are, so far as our unaided senses can determine, absolutely so, whatever the refinement of scientific analysis may ultimately declare

the volitions or impulses that control them to be. For all practical purposes they, i.e. the acts, occur precisely at the same instant, though they may theoretically be nothing more than the outcome of INCONCEIVABLY RAPID ALTERNATIONS OF VOLITION! And THIRD, that a certain amount of simultaneous work, under specified conditions, is healthy and expedient, and that under other conditions such concurrent exercise is necessary and harmless. The FOURTH proposition—that whilst we hold it to be both proper and advantageous to prepare and qualify children for the execution of simultaneous two-handed work, and more specially of two-handed writing, during their school life, it would be unwise and indeed pernicious to encourage or prescribe for our artizans and others the least amount of coincident manual labour over and above what has hitherto been found requisite for the effective performance of their duties in the several industries of manufacturing life—will require **no** proof.

First, then, to prove the possibility of strictly contemporaneous work, and that every one can learn to do two things well at the same time.

Our declaration has been challenged in the columns of an educational paper in the following words:—"We are certain that Mr. Jackson is wrong in asserting that any one can do it. Eminent men who have made a life study of mental phenomena hold that it is impossible to focus the attention on two ideas at the same instant, and that when two fully conscious processes are proceeding concurrently —so-called simultaneously—there is really a shifting of the attention backwards and forwards, so to speak, from one idea or current of ideas to the other. This doctrine is based upon careful experiments. The playing of an accompaniment to a song sung by the pianist is an example of a constant shifting of the attention, and it is only possible at sight to an expert, much of whose playing is almost subconscious; whereas the simultaneously writing of two letters involves two simultaneous streams

Left Hand.

The Belief

I believe in God the Father Almighty, maker of heaven and earth. And in Jesus Christ His only son our Lord Who was conceived by the Holy Ghost. born of the Virgin Mary. Suffered under Pontius Pilate. was crucified, dead and buried. The third day he rose again from the dead, he ascendeth into heaven and sitteth at the right hand

Right Hand.

The Lord's Prayer

Our Father which art in heaven Halloed be thy name. Thy Kingdom come. Thy will be done on earth as it is in heaven Give us this day our daily bread And forgive us our trespasses as we forgive them that trespass against us. And lead us not into temptation, but deliver us from evil. For Thine is the Kingdom the Power and the Glory For ever and ever. Amen

Simultaneous Two-handed Writing, from memory, done after a few months' practice by a girl of sixteen.
Fig. 9.

of original fully conscious thought, in addition to the absolutely different but simultaneous series of muscular movements involved."

Without replying in detail to this objection, we may remark that the critic surrenders the whole position when he admits that "two fully conscious processes are proceeding CONCURRENTLY." Exactly, that is the whole of our contention, and in support thereof the famous authority, Dr. Wigan, may be quoted, as also Dr. Brown-Sequard, whose pronouncements, so emphatic and conclusive, have been given at such length in these pages.

As illustrative of those pronouncements we will give an extract from the life of Sir Edwin Landseer, as found in the little book by Mr. Fred. G. Stephens :—

"Landseer indeed attained to such amazing mastery that he painted 'Spaniel and Rabbit' in two and a half hours; and 'Rabbits,' which was at the British Institution, in three-quarters of an hour; and the fine dog-picture, 'Odin' (1836) was the work of one sitting, i.e. painted within twelve hours.

"But by far the most amazing instance of the technical powers of our subject is that which is in itself, without regard to Landseer, a subject of extraordinary interest to physiologists and inquirers into the nature of the action of the brain and the distribution of nerve power. Our informant is Mr. Solomon Hart, a Royal Academician, remarkable for his accomplishments and acute observation. A large party was assembled one evening at the house of a gentleman in the upper ranks of London 'society,' crowds of ladies and gentlemen of distinction were present, including Landseer, who was, as usual, the lion; a large group gathered about the sofa where he was lounging; the subject turned on dexterity and facility in feats of skill with the hand. No doubt the talk was ingeniously led in this direction by some who knew that Sir Edwin could do wonders of dextrous draughtsmanship, and were not

unwilling to see him draw, but they did not expect what followed. A lady, lolling back on a settee, and rather tired of the subject, as ladies are apt to become when conversation does not appeal to their feelings or their interests, exclaimed, after many instances of manual dexterity had been cited, 'Well, there's one thing nobody has ever done, and that is to draw two things at once.' She had signalled herself by quashing a subject of conversation, and was about to return to her most becoming attitude, when Landseer said, 'Oh, I can do that; lend me two pencils, and I will show you.' The pencils were got, a piece of paper was laid on the table, and Sir Edwin, a pencil in each hand, drew simultaneously, and without hesitation, with the one hand the profile of a stag's head and all its antlers complete, and, with the other hand, the perfect profile of a horse's head. Both drawings were full of energy and spirit, and although, as the occasion compelled, not finished, they were, together and individually, quite as good as the master was accustomed to produce with his right hand alone; the drawing by the left hand was not inferior to that by the right.

"This showed that the artist's brain was acting in two directions at once, controlling two distinct limbs in similar but diverse operations; for it was observed by our informant that the acts of draughtsmanship were strictly simultaneous and not alternate. Had the latter been the case, the feat would have been of deft draughtsmanship, about which no one would have questioned the ability of Landseer. This feat far surpasses that of chess-players, who continue six games at chess at one sitting, without seeing the board. Feats like that of the chess-players, however wonderful, differ in kind from the unparalleled one we have described. These are efforts of astoundingly powerful memories and acts of the cleverest mental vision, combined with that faculty with which chess-players seem to be specially endowed, possession of which, however, by no means proves superior mental ability. Landseer's feat

was another sort, and proved him capable of doing two things at once, things which singly were, no doubt, easy of accomplishment by an artist of his faculties, but when simultaneously performed in duplicate were such as have not hitherto been recorded. Mrs. Mackenzie has enabled us to confirm this account of her brother's feats of draughtsmanship."

But there is corroborative evidence of the truth of our statement all around us in our daily and familiar experience.

It is a well-known fact, for example, that many of our bank clerks can be seen casting up long rows of figures with unfailing accuracy, whilst not merely conversing with one another, but often telling an amusing tale, as Dr. Wigan has observed.

Moreover, when we come to purely manual operations, as in ordinary trades, the weaver when pattern-weaving at the hand-loom, may be cited as one who undoubtedly has a very complicated combination of concurrent movements and volitions to execute. Yet, strange to say, we often find that whilst

(*a*) incessantly watching the thread on the bobbin,

(*b*) carefully scanning the warp as its sections are being alternated by the treadles,

(*c*) throwing the shuttle with the right hand with just sufficient force to reach the opposite side, and at the same time to avoid breaking the weft,

(*d*) moving the batten with his left hand backwards and forwards with every cast of the shuttle, and so precisely as to neither damage by excess nor injure by deficiency, and

(*e*) pedalling with both feet independently and irregularly, yet also intelligently, in order to produce the pattern required,

HE WILL BE CARRYING ON A CONVERSATION WITH AN ONLOOKER, or with a fellow-workman on the loom by his side!! Who, indeed, can witness his performance

without being impressed with the wonderfully intricate character of his work?

The violinist furnishes another example of the two hands doing two different kinds of mechanical labour, demanding a very high standard of intelligence, at the same time, and where the left hand has a more severe and difficult part to perform than the right hand has.

Once more, an organist will read and interpret an entirely new service he has never seen before, say, at a choir practice, and whilst fully alive to the mistakes of the singers—

(*a*) he will read three lines or staves of music;

(*b*) he will note the words and give expression thereto in his rendering;

(*c*) he will determine and manage the combinations and stops required for his purpose;

(*d*) he will observe and exhibit all the expression marks in the music;

(*e*) he will manipulate the four manuals of his organ with his two hands separately or otherwise;

(*f*) he will translate the third stave with his two feet on the pedals, in similar and contrary motion, quite independently; and

(*g*) he will, throughout the complicated performance, pay proper regard to the duration of each note in the service, and so fully appreciate the object of the composer as to successfully reproduce, not only the letter, but the spirit of the inspiration.

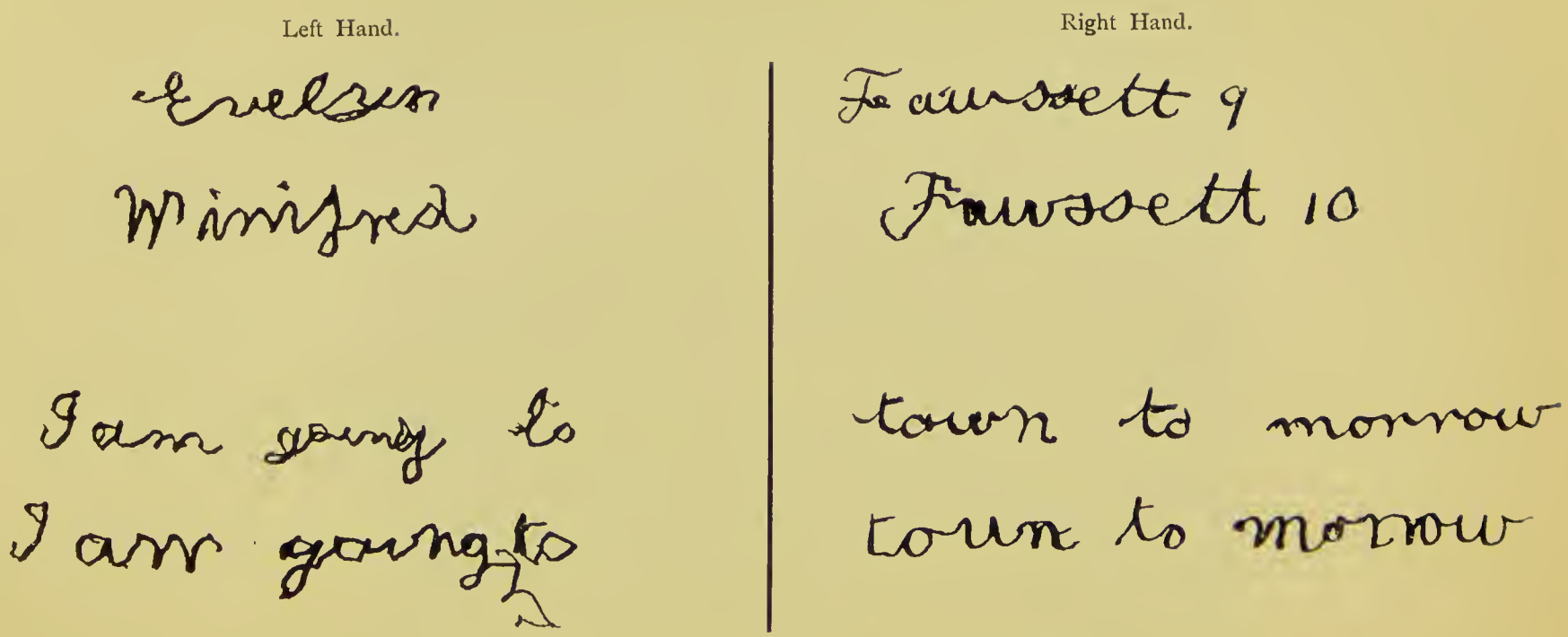
Are not these three or four types of workers engaged in the actual exercise of at least "two fully conscious processes proceeding concurrently, that is to say, simultaneously," in the same individual? We think every one must admit the fact.

The second proposition is, that the acts which we designate as simultaneous are truly and actually so, and that any explanation that science may offer, or indeed demonstrate, as to the "inconceivably rapid alternation"



A girl's **first attempt** at Simultaneous **Unrelated** Two-handed Designing on the Blackboard.

Fig. 7.



First attempts at Simultaneous Two-handed Writing by the two little girls whose names are here given.

Fig. 8.

theory (of the volitions which direct and control them) is not only quite inappreciable and undiscoverable by the most careful observation, but is powerless to either destroy or even weaken our assumption as to the nature of the movements themselves.

It is not necessary, nor is it advisable for the argument, to explain how the brain of a skilled pianist can receive scores of impressions, and discharge over TWO HUNDRED VOLITIONS IN ONE SECOND OF TIME, as is constantly being done. Any one, of course, is welcome to say that the two hands are being driven by inconceivably rapid alternations of orders issuing from but one centre; but it is none the less true that so far as reason and the most careful observation can determine, those volitions or transmissions of will are progressing simultaneously and concurrently to the ten obedient and supple digits on the key-board of the piano, where, of course, the actions themselves are obviously and strictly simultaneous in a large proportion of their percussive strokes.

Supposing that a note on the piano could be automatically struck TWENTY-FOUR TIMES IN A SECOND, would any one of our objectors undertake to either count the number struck, or to say indeed that there had been any plurality of strokes at all? No one is competent to perform such a feat, and it must be allowed that even the acts thus described and executed are absolutely contemporaneous in their nature, and that it matters nothing to the argument whether they are, in strict scientific language, driven and controlled by a series of inconceivably rapid consecutive volitions, or not.

It may be admitted without any reservation that the philosophy of "concurrent ACTS" is "alternate THOUGHT." But this admission does not and cannot alter the fact that those actions are themselves proceeding at exactly the same instant of time.

For example, the specimens of simultaneous writing in fig. 8 were done by two little girls in the presence of

their mother and myself. They had never attempted either left-handed or two-handed writing until the occasion on which these very creditable productions were executed, but in their brushwork and some other occupations the two hands had been either separately or concurrently employed.

The actual execution of these writings was NOT CONSECUTIVE, nor could they be with any truth described as hesitating or interrupted. No, they were ALMOST as continuous and flowing as when each girl was using her right hand alone. Indeed, it was surprising to me that there was such a uniformity of steady progress, for I little suspected that the girls would exhibit such wonderful command of their two hands in the test.

It will be observed in these first attempts that the left-hand writing is inferior to the right in steadiness of stroke—which is a natural thing, and almost an inevitable one—but it will also be remarked how much the right hand and stroke suffer, and fall far below the normal standard by this simultaneous effort. The explanation is not far to seek. Many psychological problems of the deepest interest and importance present themselves in connection with the development of concurrent impulses and acts. The whole question bristles with curious and attractive speculations that can only be satisfied and solved by experience and investigation.

In giving the next examples of simultaneous work, it is needful to say that they are the outcome of barely seven months of elementary practice in copy-book writing; that her first attempt at two-handed concurrent writing outside those copy-books was the production of the two letters, of which copies are here given, and that no tuition whatever was received by her during the period named. The writer of the specimens was sixteen years old. (Figs. 9 to 14.)

With regard to the examples which include the working of a few elementary calculations, the diversity of the

These two letters were

Left Hand.

3, Park Terrace,
Beverley,
East Yorks.

Sep 29th 1902

My darling Mother

Father told me that I ought to be able to write a different letter with each hand so I am endeavouring to do that same. I hear that Alf is home again, I suppose that he is just as ever. By the bury this is written with my left hand. & Father's is with my right I am longing to see you all again, as I think I remarked in my last letter I started to write in pencil, but thought better of it & rubbed it out again I cant think of anything to say

Fig. 13.

written **simultaneously.**

Righ Hand.

Sep 29th 1902

3, Park Terrace,
Beverley,
East Yorks.

My own dearest Father

Thanks so much for your nice long letter which I received by the 2nd post this morning. I was so glad to hear about my dear wee doog, that he is so good. You had not got those copy books evidently by the way you ~~dog~~ wrote. when you did write. I am in agony just now. trying to write two letters at the same time. It is not so easy as it looks. I havent any news to tell you, so you must be content with a short note I hope you will be able to read this

Fig. 13.

Left Hand.

just now as my letter yesterday exhausted
it all. so I will say au-revoir, heaps of
kisses & things

I am ever your loving daughter

Daisy

Fig. 14.

written **simultaneously.**

Right Hand.

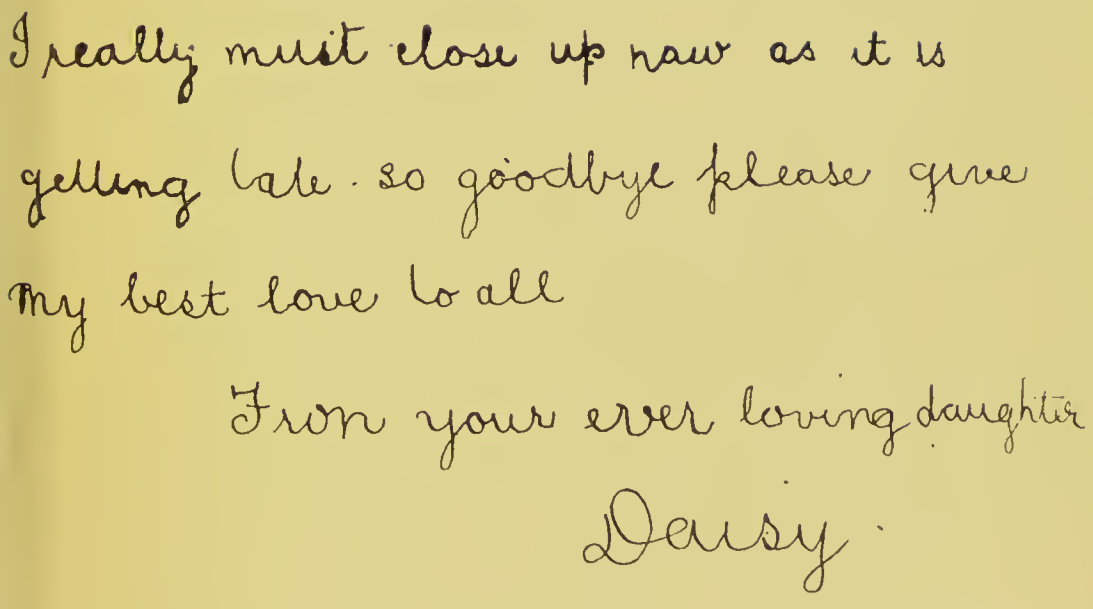


Fig. 14.

Left Hand.

Ambidexterity. This is an advertisment for Quaker Oats in the Royal Magazine for April 1902
Daisy V. Jackson

November 26 1902
This writing is simultaneously done with the drawing on the opposite side of paper. The drawing is copied from the advt The whole took about ¾ of an hour doing

Right Hand.



Simultaneous Two-handed Work after a few weeks' practice.
Fig. 11.

Left Hand.

These two sides were done **concurrently**.

Right Hand.

1429. Orleans relieved by Joan of Arc in 1429.

1429 Orleans relieved by Joan of Arc in 1429

1760. Quebec captured by General Wolfe 1760

1760 Quebec captured by General Wolfe 1760

1851 Victoria capital Melbourne large gold fields

1851 Victoria capital Melbourne large gold fields

1859 British Columbia has magnificent forests gold

1859 British Columbia has magnificent forests gold

North Pole is always vertically under the Pole Star

North Pole is always vertically under the Pole Star

Ortegal, a cape on the N. coast of Spain, Galicia

Ortegal a cape on the N. coast of Spain Galicia

Simultaneous Two-handed Copy-book Handwriting after less than a year's irregular practice, by a girl of sixteen.
Fig. 12.

Simultaneous Two-handed Copy-book Handwriting after less than a year's irregular practice, by a girl of sixteen.
Fig. 12.

actions is obvious. There is no connection between the two streams of thought in the writing; there is no relation between the writing and the drawing; and what association can there be between the drawing and the arithmetic?

Necessarily the difficulty is greatly increased where models or headlines have to be copied as in fig. 12, because the attention has to be directed to the copy, and also to the imitation, at any rate partially.

These samples of concurrent two-handed work prove two things—first, they demonstrate the proposition which we set out in this section to establish, viz. the absolute coincidence of the acts alluded to; and second, the AMAZING POSSIBILITIES which exist in a fully developed and systematic scheme of Ambidextral Culture, when such scheme shall regulate our education and permeate the community.

To prove the third proposition it will only be necessary to resort once more to what is actually going on all around us. It is matter of common knowledge that at present in a large number of professions and handicrafts two-handed skill is needed, and that concurrent Ambidextral ability is no less an indispensable qualification. Through the whole domain of sports, athletics, surgery, music, engineering, and weaving—with scores of other occupations—the workman MUST possess—be he university lecturer or skilled artizan—TWO DEXTROUS HANDS, and he must also be competent to use them both at the same time with equal reliability.

IT IS NOT FOUND, AND IT HAS NEVER BEEN FOUND, THAT SUCH SIMULTANEOUS WORK, ALTHOUGH CONTINUED DAILY FOR AN ENTIRE LIFETIME, HAS EVER EXERCISED A DELETERIOUS EFFECT UPON THE MENTAL OR PHYSICAL STRUCTURE, FACULTIES, OR FUNCTIONS OF THE INDIVIDUAL!!

Ergo, simultaneous Ambidextral work must be harmless and healthful, as well as expedient and necessary.

Such being the position, the question arises, What

objections can be urged against it? What are the reasons, if any, why the two hands should not be employed simultaneously to the extent, and in the manner, set forth in the preceding pages? They are all comprised in these two:—

1st. That simultaneous work conduces to mediocrity in mental development, and diminishes the power of concentration.

2nd. That simultaneous work is an abuse of the brain's activity and would lead to evil results.

Speaking generally, these two objections are purely hypothetical. And whilst we are quite willing, nay anxious, to have the whole subject ventilated in the most thorough manner, as the following paragraphs will show, we most strongly take exception to charges of such a nature being considered as capable of influencing the controversy one way or the other. That these objections have no foundation in fact, will be apparent as the discussion proceeds.

We are told that exercising the brains on two totally different subjects at the same time produces mediocrity, inasmuch as it diminishes the power of concentration. The objector shall speak for himself:—

"The reason that I fear that mediocrity is likely to be the result of simultaneous work with the two hemispheres of the brain is that I cannot help thinking it is likely to destroy the power of concentration, and it is my experience which leads me to fear it. . . . I was at one time in the book trade, and at one period was in the cashier's desk. My time not being fully occupied, I used to read during the intervals, and became so far absorbed in my book that the noises in the shop did not affect me unless I had some concern in them—that is, that my brain was following the story, and at the same time was alert to notice the particular sounds and actions which called for my attention. I found that the habit which I then formed prevented me from concentrating my thoughts on a book or problem

when talking was going on around me, and still suffer to a certain extent from the same inconvenience. I also find musical sounds so masterful that if I am talking to any one and music commences, I lose the thread of my argument if even the music be only that of a penny whistle. I do not know whether this is connected. Now there must be many people who are similarly constituted to myself, and it seems to me dangerous to accept as a general principle a course of action which may have the effect of lessening the power of concentration in some cases, for I think we are all agreed that it is the concentrated worker who is most likely to be of use to himself and the world."

With all deference to the author of this objection, we think not only that the facts are insufficient, but that the logic is utterly bad. Apart from every other consideration, the argument is unsound and the deductions valueless, because there is no information as to the powers of concentration possessed by this gentleman prior to his assuming the duties of cashier. Given that his faculty of concentration was perfect before he occupied that post, we then have a requisite condition for entering upon a critical examination of his objection, but in the absence of that information it is patent that there is "no case." However, there is no desire to treat the obviously sincere difficulty with such scant courtesy, and for the sake of analysis and discussion it shall be supposed that his power of concentration was not only perfect, but was abnormally developed. Looking carefully into the facts stated, it is seen that during the intervals of repose from active duty he occupied his mind in reading, and he became so far absorbed in his subject as to be absolutely indifferent to the noises in the shop **unless they concerned himself.** Here another essential element is lacking in the premises, viz. the length of time in which he was following this occupation, for he says that THE HABIT then formed prevented him in after years concentrating his thoughts

on a book or a problem when talking was going on around him, which defect (as he considers it) he still suffers from —many years subsequent to the formation of the habit. But surely his syllogism has gone all wrong. He says that the **habit formed of concentrating his thoughts on** a story so completely as to be oblivious of all talking and noises around him (unless such noises and talking concerned his duties) afterwards prevented him from doing the very thing which had become a habit or second nature with him in the shop! This is inexplicable. If you contract a habit, you have it, you possess it; but our objector says the very contraction of the habit prevented him from exercising it, or disqualified him for the performance of it! It is an impossibility. It is a contradiction in terms. And what is to be said regarding the perfect powers of concentration that he possessed before contracting this habit, in the shop? If, by this practice at the desk, he acquired the power of so concentrating his mind on the subject-matter of his book as to be totally indifferent to the manifold noises all around him, and got so accustomed to this faculty that it became a habit, how, in the name of logic, or reason, or fact, could that habit prevent him from concentrating his thoughts on a book or problem when talking was going on around him in the house or elsewhere at an afterdate, or in other words, how can a habit prevent itself?

Once more the logic is bad when it is assumed that because a man is unable to study in a babel of noises, therefore he lacks the power of concentration. Most of our greatest thinkers, our deepest and most profound philosophers, require solitude or silence during their times of work; and why is silence imposed upon the members of every reading-room if it is not because talking distracts the mind or "prevents concentration"? Surely the objector does not mean to say that because a man cannot "reason in a riot," therefore he is not thoughtful and is incapable of thinking; or that because he must study

in silence, therefore he is characterized by mediocrity in mentality? The fact that this gentleman was so sensitive to external noises, and so hypersensitive to the witching notes of music, even when issuing from "a penny whistle," is no evidence whatever that the doing of two things simultaneously at the paying-desk had destroyed or impaired his powers of concentration. As well might we say that because silence is imposed in a concert room—the audience being unable to appreciate the performance in a rabble—the listeners are not musical or are incapable of listening.

But the reply of the objector is that the brain was "following the story and at the same time was alert to notice the particular sounds and actions which called for his attention." Once more the facts are defective, because the two lobes were not actively engaged at the same time; the first was engaged, according to the statement, in reading and apprehending the novel, the other was "alert," on the *qui vive*, but absolutely insensible to all noises save those of a certain kind; figuratively speaking, the second lobe (if we assume the brain to be functionally as well as organically dual) was synchronized to particular sounds, and it only responded to those sounds. This can hardly be called active ratiocination, and the whole thing is a mere bagatelle compared with what goes on in every workshop, laboratory, factory, schoolroom, and every kitchen in the land. What more complicated, or more psychologically remarkable or unusual, what more difficult is there in this action of our critic, than in the daily occupation of a mother, who, whilst actively engaged in domestic duties, is ever on the alert for the cry of her young babe; than in the ordinary avocation of the cook, who, however busily occupied in culinary duties, is ever on the alert for the first smell of burning from the oven; or in a thousand-and-one trades and handicrafts all around us where the artizan, whilst engaged in far more complicated and difficult functions than the reading of a novel could

ever become, must be, and ever is, on the continual strain to see a weakness, to hear a variation, or to feel a tremor, that shall indicate danger to the fabric, the metal, or the machinery over which he is presiding? The idea that we cannot do two things well at the same time is entirely wrong, and is contradicted in actual life every day of a person's existence, as we have already seen.

In conclusion, there is no evidence to show that dual and multiple action of the brain and simultaneous exercise of both hands under ordinary conditions are in the least degree calculated to impair the power of concentration or to produce mediocrity in mental development; but there is abundant evidence to show that such dual and multiple action and such two-handed simultaneous work are practised universally and generally without any such undesirable consequences resulting therefrom.

The second objection which has been advanced against "concurrent handiwork" is that the writing of two letters at the same time "is an abuse of the brain's activity, and will lead to evil results"! In other words, that it is too great a strain, and that it therefore positively injures the mental powers. As this is the pronouncement of a recognized authority and of a most distinguished specialist on the brain, we feel some considerable hesitancy in replying to it. However, so confident are we in the position we occupy and in the corroboration of our theory which is to be found in every section and department of the community, that we do not for one moment fear the result. Since this authority holds the opinion "that the brain is functionally ONE, so far as thought and all such high endowments are concerned," it is not a matter of surprise that he objects to "the simultaneous writing of two epistles with both hands."

The most effectual answer to such an objection will be, we think, to make a frank and unqualified appeal to existing customs, to prevailing and well-known methods,

to practical life and incontrovertible facts. Casting our eyes around us, there is little difficulty in obtaining ample material for our purpose.

We take the weaver at the hand-loom as a specimen, whom we have watched for so many hours in our boyhood's days. Ten hours constituted the full day's work at that time, but how many workers continued their labours to twelve or fourteen hours, for weeks together, who can tell? Now if any one will consider the manifold and actually concurrent acts of the two hands and the two feet of the artizan in the process of weaving, as previously outlined; how, in addition to the contrary and independent movements of all four limbs, the attention must never be allowed to stray from the silk, cotton, or thread in the bobbin or cop of the shuttle; how the automatic action of the two hands must be regularly maintained; how the movements of the feet (which are both automatic and intelligent, requiring unremitting care lest the wrong pressure of the treadles disarrange or spoil the warp) must be carried on with the most unremitting precision; and how, lastly, the warp itself, as the weaving proceeds, demands the greatest vigilance on the part of the workman from the first throw of the shuttle to the very last;—it will promptly be conceded that here we have an instance of complicated, combined, simultaneous, intelligent, and automatic movements, compared with which the mere composing and writing of two different letters are only child's play. Yet it is not found that a lifetime of such employment, engaging the powers of the individual for eight or twelve hours daily, exercises any such deleterious effect on the mind as is shadowed forth in the second objection. On the contrary, the weavers of that day were conspicuous, in the various trade agitations that occurred, for their superior intelligence and shrewdness, their keen wit, and their logical acumen. Many other handicrafts afford similar illustrations of this dual and multiple action of the brain

in long-maintained occupations, and **with just as little harm to the mechanic.**

It may, therefore, be accepted as true that thousands and tens of thousands of the artizan class are engaged daily in compound or manifold work that requires simultaneous attention to, and direction of, two or three, or even more, processes and functions in their respective trades, and in all cases without any impairment of their reasoning faculties.

But looking more closely into the Doctor's pronouncement, let us ascertain what he means by "functional unity, so far as thought and all such high endowments are concerned." Does he mean that the brain is actually limited and restricted to thinking only one thought at a time, and that it is impossible for it to think two? If so, and he is correct, there can be but little danger in the attempt to do it, for it can but result in ignominious failure. It simply cannot be done, and no one need try; therefore the simple and so-called simultaneous writing of two different epistles, as well as the complex and assumed concurrent acts of the weaver, are reduced to the commonplace exhibition of instantaneous alternations of volitions, with which even the ordinary brain of the rawest countryman is perfectly familiar from his youth upwards. Hence the complicated movements of the two hands and two feet of the organist over the manuals, stops, and pedals in the interpretation of a new service, and his criticism of his choir's singing—with all the multifarious demands upon his attention which such an achievement necessitates, are all the result of "instantaneous alternations of volition," even when several of those motions or acts involve continuous concurrent attention and intelligent control! . . . If so, then argument is useless, and there necessarily cannot be any such thing as THE BRAIN DOING TWO THINGS AT THE SAME TIME; all it can do is to transmit, say to the two hands in the act of simultaneous writing,

instantaneous alternations of orders to write this and that respectively.

But if, as Dr. Wigan in his nineteenth proposition states, "One cerebrum may be entirely destroyed by disease, . . . may be annihilated, and yet the mind remain complete, and capable of exercising its functions **in the same manner and to the same extent that the eye is capable of exercising the faculty of vision when its fellow is injured or destroyed**,"—and we have not yet seen this statement contradicted, for the annals of surgery are confirming it in every week of the year—the conclusion that the brain is a dual organ, and **functionally** double, at the least, is absolutely irresistible.

Further, it may very pertinently be asked, if one lobe of the brain (one side or one brain) can thus be removed, and its fellow continue the process of volition, &c., apparently as well as before, WHAT WAS THE SPECIAL FUNCTION OF THE ABSENT ORGAN PRIOR TO ITS DISAPPEARANCE? SURELY IT POSSESSED THE SAME POWERS EXACTLY AS THE SURVIVING MEMBER? If it happened to be the left lobe in a right-handed person, according to all orthodox teaching the destroyed hemisphere was superior to the one left behind, or at any rate was developed to a greater extent, and was, as Dr. Bastian himself calls it, the **leading** hemisphere.

That there are two hemispheres (so-called) is unquestioned; that the difference in organization between them is small, and may be made much less by cultivation, is universally admitted; that their functional activity and ability may be practically equal is not denied. Why, then, may not both act as well in independence of each other as in combination? We cannot say, and Medical Science has not yet supplied an answer.

Sir James Paget, in a public address some years ago, stated that "he remembered once hearing Mdlle. Janotha play a Presto, by Mendelssohn, and he counted the notes and the time occupied. She played 5,595 notes in four

minutes, three seconds. It seemed startling, but let them look at it in the fair amount of its wonder. Every one of those notes involved certain movements of a finger, laterally as well as those up or down. They also involved repeated movements of the wrists, elbows, arms, altogether probably not less than one movement for each note. Therefore there were three distinct movements for each note. As there were twenty-four notes per second, and each of those notes involved three distinct musical movements, that amounted to seventy-two movements in each second. Moreover, each of those notes was determined by the will to a chosen place, with a certain force, at a certain time, and with a certain duration. Therefore there were four distinct qualities in each of the seventy-two movements in each second. Such were the transmissions outwards. And all those were conditional on consciousness of the position of each hand and each finger before it was moved, and, while moving it, the sound of each note and the force of each touch. Therefore there were three conscious sensations to every note. There were seventy-two transmissions per second, 144 to and fro, and those with constant change of quality. Let them imagine it in telegraph wires. And then, added to that, all the time the memory was remembering each note in its due time and place, and was exercised in the comparison of it with others that came before. So that it would be fair to say that there were not less than 200 transmissions of nerve force to and from the brain outwards and inwards every second, and during the whole of that time judgment was being exercised as to whether the music was being played worse or better than before, and the mind was conscious of some of the emotions which the music was intended to impress."

Apart from, and in spite of, the fact that the figures are not quite accurate, as calculated from the statistics given (there being not twenty-four notes per second, but only twenty-three) the gross estimate of "200 transmissions of nerve force to and from the brain outwards and inwards

every second" is undoubtedly a moderate one, and, candidly, we are bewildered when we contemplate the phenomenon.

Does not such an amazing achievement suggest the idea that either the mind is of so infinitely subtle a nature as to be possessed of powers surpassing our wildest conceptions, or that it is composed of a multiplicity of intelligences each of which is competent to perform all the functions and volitions of a complete intellectual faculty? Even a dual or a triple mind would seem quite inadequate to accomplish so marvellous a task. But there is still more beyond all this, for if 200 intelligent volitions or movements per second be the extent of Mdlle. Janotha's performance, can we not fairly and reasonably expect that her own, or a Paderewski's brain, shall exceed even this stupendous effort, and execute as many as 250 distinct intelligent movements in one second, if the requisite practice or training were taken!

Whether the brain be functionally single, dual, or manifold, what matters it as to the question before us? If as a single organ it is able to accomplish 200 separate volitions or transmissions of nerve energy in a single second of time, which transmissions are thus practically instantaneous and concurrent; if as a dual organ or manifold organ the brain can successfully despatch the same number of intelligent messages to divers destinations in the human body in the sixtieth part of a minute—that is, to perform no less than TWO HUNDRED consecutive and concurrent acts; and if, as either a single or a multiple organ, the brain can continue and maintain such phenomenal activity for one, nay for two hours at a time without apparent injury,—how can the insignificant and comparatively easy work of writing two letters at the same time be considered dangerous or damaging to the writer? The operation is simplicity itself when contrasted with the transcendental complications connected with the rational apprehension and the correct emission of 200 musical and psychical commands!!

The fatal inconsistency of our objectors is clearly displayed in the fact that when they commit their own children to the tender mercies of pianoforte teachers, they raise not even a whisper of protest when it is found that the juvenile pupils are being instructed to do two totally different things with their hands at exactly the same time! Oh no, the idea seems never to strike them that a course of lessons on that beautiful instrument has for its chief and ever dominant aim THE EQUAL SIMULTANEOUS DEVELOPMENT OF BOTH HANDS; also that throughout the entire musical life of the child its future success or failure absolutely depends upon the attainment, or non-attainment, of this two-handed skill; and further, that the ofttimes wearisome daily practice imposed by the professor—and most cordially approved of by the parent—is far more severe, far more exhausting, and far more intricate, than the short, easy, and progressive, simultaneous two-handed writing lessons given in class routine according to the lines laid down in the pages of this treatise.

Undoubtedly, if it be objectionable—as conducing to mediocrity, diminishing the power of concentration, and damaging the brain-tissue—to prescribe simultaneous calligraphic two-handed exercises, MUCH MORE objectionable and pernicious, MUCH MORE inexcusable and reprehensible is it to inflict upon our children such a rigorous and exacting cruelty as a two-handed musical course of study and practice must, by parity of reasoning, inevitably prove to be.

It must therefore be granted that the objections raised against concurrent Ambidextral handwriting (as previously detailed) either entirely lose their proclaimed virtue in the face of universal custom where musical training is concerned, or, if they have any inherent force against calligraphy, it is multiplied TENFOLD when applied to pianoforte instruction.

WHEREFORE, this modicum of simultaneous two-handed penmanship (which, by the way, is not a preparation for

future concurrent bimanual performances, as is the case in a musical course) must be accepted as innocent, legitimate, and advantageous, OR piano-teaching is an injustice and a barbarity to be summarily condemned and abolished!

Moreover, it may not be amiss to draw attention to a well-known significant and apparently conclusive circumstance.

No one denies that women are much more widely Ambidextrous, and to a much greater degree, than the stronger sex; which, as already shown, is owing chiefly to their piano-playing, and to the multiplicity of their personal and domestic occupations where the simultaneous and separate use of both hands is imperatively required.

Again, no one will question for a moment that the successful preparation for a mathematical tripos examination and for a senior wranglership demands the highest possible quality of brain matter, and the intensest form of concentrative ability on the part of the candidates.

How is it, then, we ask, that women students hold their own in the Cambridge contests, and that such a large proportion of them secure the highest honours when in open competition with their SUPERIOR (!)—because one-handed—male rivals?

And not only in mathematics, but in medicine and science, in language and literature do we find these inferior — because partially Ambidextrous — individuals taking their full share of honours and distinctions in the very teeth of a class of competing candidates, who have the three-fold advantage of NATURAL SELECTION (a legacy of success through many generations), a more robust and vigorous physique and temperament, and the vaunted superiority of a lopsided one-handedness.

If this, to us inexplicable, phenomenon can be satisfactorily explained by those who so emphatically denounce Ambidextral culture, much will be accomplished towards the substantiation of their hypothesis.

Lastly, we will take the well-known PAUL CINQUEVALLI as a typical case of multiplex manual and mental action. Among the amazing combinations which he exhibits is the following:—He balances a tumbler on three straws resting upon his upturned face, he twirls a hat on a stick that he holds in his right hand, whilst with his left hand he juggles with two other hats which he keeps in continual motion by throwing them up in the air alternately, and all the time maintaining the balanced tumbler on those three precarious straws!

Moreover he writes me as follows:—"Without knowing that Ambidextral culture had such marvellous results, I some years ago trained myself to sit at a piano and play an accompaniment with the left hand to my own whistling, composed of various tunes which were dictated to me by a person standing on my left; at the same time another standing on my right dictated a letter which I wrote down with my right hand.

"Also I could follow a conversation between two people, juggle two or three objects with my right hand, and follow a third person trying to puzzle me by rushing from one tune to another. . . . I feel it my duty to congratulate you on such marvellous success. I have years ago experimented a great deal to use my hands and sight independently of each other in quite different ways, but this was only to entertain. Your culture will be of great service to the coming generations."—(March 15th, 1904.)

Now does this daily and perpetual simultaneous work and strain injure the mind or brain of this popular juggler any more than the concentrated study and unidextral handwriting of a senior wrangler does a Moulton? Does a pianist—Busoni or Paderewski—deteriorate sooner or more than a novelist—as Barr or Pemberton? Does the Ambidextral organist fall into decay so much sooner than his unidextrous vicar? When and where in the whole range of volition and movement have we one single instance of the injurious character of dual or multiple

action of the mind, or of its damaging influence upon the brain and upon its maximum working strength? NOWHERE, AND NEVER! IT IS UNKNOWN.

Reviewing the entire question, we think it has been satisfactorily established that there are dual and corresponding motor centres in the two brains, or brain lobes, respectively, each of which, quite independently of its fellow, is fully competent to carry on all the ordinary processes of reception and transmission; but that with reference to the mind, it may be single, dual, or multiple; and in any case it is capable of transmitting such rapidly successive volitions as to be practically instantaneous and simultaneous in their character.

Wherefore the conceiving and conveying of two separate and unrelated, but concurrent, trains of thought to two different sheets of paper can by no means or stretch of the imagination be considered as either difficult or dangerous, even if prolonged for a series of hours, or over a number of days during the ordinary working times; and, still further, the cultivation of the two hands to an equal degree will, according to Gowers (pp. 122-4), to Bastian (p. 135), to Noble Smith (p. 126), and to every modern authority, tend to the more perfect, uniform, and symmetrical development and organization of both brains (or lobes of the brain) so that the individual must thus be advantaged to an extent hitherto unapproached by any system of unidextral education.

In conclusion, there is not a student that sits down to the piano to accompany her own song that does not engage in a much more trying and intricate exercise than that of which we are speaking. The proof of this is in the fact that **a girl of seventeen has written two letters concurrently at the first attempt quite successfully** (after eight months' practice of elementary copy-book imitation work), as may be seen in figs. 13 and 14 of this Manual; whereas to accomplish the other and harder task equally satisfactorily requires years of study and practice.

That years of such study and practice produce neither mediocrity, diminution of concentrative ability, nor loss of brain power, but quite the contrary, is seen in the fact that organists and pianists are amongst our most profound and accomplished musicians and authors ; men who have written some of the greatest musical compositions the world has ever seen ! ! All biological phenomena demonstrate the great principle that concurrent dual or multiple action of the brain or mind has undoubtedly a stimulating and healthy effect upon the mental faculties, and it may therefore be confidently anticipated that the small amount of simultaneous two-handed work prescribed to school children under the scheme shadowed forth in these pages will have a most salutary influence upon their lives, in addition to so materially increasing their usefulness as Ambidexters in the numerous domains of literature, science, and art which they may ultimately occupy, as to raise the standard of that usefulness many grades higher than it has ever yet reached.

Generally speaking, then, it may be safely conceded :—

1. That there is a latent power or faculty in every sane person to execute two totally different things or acts with his two hands simultaneously, those acts being either mechanical or intelligent.

2. That every person is capable of becoming as expert in the execution of two concurrent unrelated acts as he is in the performance of one.

3. That the scientific culture of each hand singly, and of both hands simultaneously, throughout the entire school-life of the child is attended with the most desirable results, manually, mentally, and physically.

4. That the introduction of any additional simultaneous manual labour in the several handicrafts and pursuits of manufacturing and commercial life, beyond what has hitherto been found essential to the effective discharge of duty and to the perfect efficiency of the workman, would be unwise, dangerous, and is to be strongly resisted.

PART II.—PRACTICAL

CHAPTER I

AMBIDEXTRAL CULTURE OR BIMANUAL TRAINING

THE expediency of adopting ambidextral instruction in schools ought not, in the fitness of things, to require a word of demonstration. Those who have devoted any time at all to the subject are unanimous in their verdict; and therefore we are having a phenomenal rush towards free-arm blackboard drawing and bimanual art-teaching, both amongst publishers and teachers. These converts to handicraft are quite convinced of its great advantages in certain occupations of life or in particular branches of educational work, such as drawing, clay-modelling, wood-carving, piano-playing, and carpentry; but, strange to say, they fail to generalize, and to grasp the much more important truth that A UNIVERSAL TWO-HANDEDNESS, similarly adaptable to and available in every function and department of industry, is, or ought to be, the real object of our efforts.

It is reasonable to suppose that if a partial introduction of bimanual skill is so valuable in a limited number of employments, HOW MUCH MORE DESIRABLE AND NECESSARY is it to possess the wider, the complete development of the faculty, so that the whole community shall reap the inestimable benefits of such an acquisition in all its innumerable ramifications?

Thus if all our sailors and soldiers, our surgeons and

sportsmen, our artists and artizans, our clerks and cricketers, and all other manual operators, were as adept with the left hand as with the right, what a revolution would be effected in the realms of navigation, warfare, commerce, manufacture, art, science, and sport!

But what is the present condition of things? It is pitiable; for of all the millions of embryo mechanics and manipulators that are turned out from our schools every year throughout the Empire, NOT ONE OF THEM IS PREPARED, OR ABLE, TO ACQUIT HIMSELF AS HE OUGHT TO DO, AND AS NATURE HAS QUALIFIED HIM TO DO! No! They are without exception lopsided, imperfect, miserably deficient candidates for the numerous occupations they hope to enter. Certainly they are all possessed of two hands which, having no natural physical disability, ought to be equally capable of doing any and every kind of work; but instead of this, we find that whereas one hand has graduated with honours, the other has not got through the rudiments of an elementary education.

Is the candidate a medical student? Has he not to go into training with his incompetent left hand, and often for a long period, ere he can hold and use his surgical instruments? And whatever profession or trade the candidate may intend to follow, has he not, almost always, to waste precious time in training his left hand to do that which his nurse, his mother, and, worst of all, his teacher, most vigorously and rigorously disqualified it for doing during the many years that he was amenable to their cruel kindness?

School is supposed to be the preparation place of our children for their future lives, and yet 999 out of every 1,000 schools in the country neglect—deliberately and of set purpose neglect—the cultivation of one of the most useful members of the body, although common sense, common fairness, and the common occupations of every-day existence (as well as the respective exigencies thereof)

alike demand a two-handed dexterity which they have failed to provide. On this ground of handcraft alone (the equal and interchangeable use of the two hands in all conceivable employments wherever such use is possible) our contention is justifiable, and it may be taken for granted that a comprehensive and liberal scheme of bimanual training is a desideratum of a perfect education that nothing else can or ever will supply.

Hand-training, then (by this term we mean two-handed training), should begin at home and in the nursery. And it is here that the least trouble is required, and, curiously enough, it is from here that the strongest opposition will possibly be encountered. For is it not a fact that nurses and mothers fret themselves constantly and weary themselves exceedingly in actually suppressing the easy, rational, and natural use of the infant's hands? Where, we ask, is the difference between this English mother's crippling of her child's left hand, and the (as we think) mistaken and benighted Chinese mother's crippling of her infant's tiny feet? The principle, assuredly, is the same; AND THE RESULT IS SIMILAR, viz. a physical disability of a grave and far-reaching character; a disability, it must be observed, far more grave and disastrous in its effects in the case of the hands than in the case of the feet. Henceforth, let the nurse and the mother concentrate their efforts on the encouragement of two-handed dexterity in the babe, presenting the toy, or other article, sometimes with the left hand, sometimes with the right, that the child may take it alternately with the right hand and with the left. By this simple method an indifferent and indiscriminate use of both hands will be engendered that will soon exhibit its effects in a general quickening of the impulses and, indeed, of the whole being. Instruct the child to use either hand when holding the spoon, or knife, or fork at meals; when buttoning or unbuttoning its dress; when brushing the same; when whipping a top; when riding its hobby-

horse; in short, whenever one hand is engaged in any occupation, let the other (the sinistral—be it right or left) have its fair full share of the exercise. Before the child is old enough to go to school it will by these means become a fairly skilful Ambidexter, quite prepared to take its place, and that creditably, in the scheme of systematic training which awaits it for the next six or seven years, or possibly more, of its life.

If the mother only performs her part in this great educational work by stimulating her offspring to practise the sinistral hand (be it right or left) diligently and faithfully on all possible occasions—even offering such potential inducements as small prizes for excellence in two-handed manipulation—the first and chief difficulty is overcome, and the first essential step towards a perfect Ambidexterity has been successfully taken.

What will now be the condition of our juveniles when ready to enter into school-life? If the child has received the home-training which we have faintly outlined, it will practically recognize no difference between the two hands so far as daily use goes. It will involuntarily use either hand, and the one which is the more convenient at the instant, in whatever exercise it may be employed. The distinctive names "right" and "left" will convey no meaning to the child's mind beyond the fact that the hands are so called to distinguish them from each other; precisely in the same way, and no more, that we say "right and left eye," "right and left ear," "right and left foot," "right and left side." Should the infant be one of the seventeen right-hand biassed, or one of the three left-hand biassed, it will naturally have a predisposition to use that dexter hand somewhat more frequently than, and preferentially to, its sinistral hand; but the ability to use both hands similarly and interchangeably will not be less marked or less developed than in the case of those who are unconscious of any such strong natural tendency.

In all infantile and juvenile actions and recreations

there will be seen an actually indiscriminate, independent, and perfectly free employment of both the little hands ; so that whether spinning a top, trundling a hoop, digging in the sand ; whether drawing a ship or writing a line of pot-hooks, each hand is brought into requisition, either in accordance with the exigencies of the exercise, or at the caprice of the actor.

From the nursery to the school is a very serious step to most children ; but its great importance need not here be more than adverted to in passing. We would, however, strongly emphasize the necessity that all our Ambidextral instruction must be based on scientific principles, must be conducted on systematic lines, must be restricted to no limited area, and must be both consistently and enthusiastically carried into every department of school-life. In the school, even more particularly than in the home, must the child be trained to make no difference, and to recognize no difference whatever, between the two hands. Each member must be co-equally employed, and the special duty of the teacher will be, not as at the present to train and perfect a dexter hand, but to keep a vigilant look out for any obviously defective, or partly developed, sinistral hand ; and then to bring all his powers to bear on the cultivation of such backward member until it is fully raised and restored to the standard of its more skilful brother.

Evolutionary progressive lessons or class exercises for the hands and arms should be practised every day of every session for, say, ten minutes at a time. Later on, when a higher degree of proficiency has been attained by the pupils, five minutes each morning and afternoon will be sufficient. The intelligent teacher will be able to suggest and formulate numerous combinations of dissimilar motions for the two hands which will cause the greatest merriment in the class, whilst it will tax the powers of the pupils to no small extent to execute them ; and at the same time be most helpful in promoting their progress and development

to a proportionate degree. These exercises should consist of both similar and dissimilar movements, in order to insure the most complete independence of action in contrary, as well as the most perfect coincidence in similar, motions.

When considering the teaching of handcraft in the various class subjects, it will be advisable to take the infant school first. Two-handed writing will form the chief exercise here, as also in the upper schools or departments (boys' and girls'). It will therefore have a chapter to itself (see Chap. II. Pt. II.). The ordinary kindergarten occupations generally admit of the most effective Bimanual instruction possible, and special pains should be taken in this stage to secure natural and unconscious reciprocity between the two hands—a consummation that will not be found difficult of attainment with ninety-nine out of every 100 of the juveniles. Brushwork and basket-making offer particularly valuable opportunities, and the former should regularly be done by the two hands simultaneously, as well as—less frequently—with each hand separately.

By the time this infant-school course is finished, the pupils will be able to write and to draw with both hands concurrently, with no small degree of fluency and excellence. So far as that course goes, these Ambidexters will exhibit a skill with both hands, either separately or together, over and above anything that one-handed training has ever produced; and if the education has been conducted on proper lines, there should be as little difference in the use of the two hands as there is in the use of the two feet.

When the child leaves the infant department and enters the girls' or boys' school, the third and final stage of its Ambidextral novitiate will begin. In the first or preparatory stage the course consisted almost entirely of mechanical pressure or influence, with the least amount of intelligent appreciation on the part of the child. In the second or intermediate stage there was less of the

purely mechanical training, and more intelligence was infused into the instruction.

Here, in the last, the longest and the most interesting stage, the training appeals principally to the mind and intellect, because the equal and perfect use of the two hands has become, one may say, absolutely instinctive and automatic. Hence, it is during these five to seven years of school life that the consummation of Ambidextral skill is to be realized, and that the subconscious element in handcraft, in one word the automatism, is perfected. It is only when this is achieved that the development can be looked upon as complete and finished. The children are now, to a considerable extent, capable of appreciating the value of two-handedness, and the stimulus afforded by this knowledge on the part of the scholars will prove a great help to the teacher.

Various interesting questions will arise from time to time—questions physical, physiological and psychological —when comparing the work of the two hands. In some occupations the left hand will actually be found superior to the right; in others the right will be the better hand; whilst in a very large proportion the two hands will be about equal. Then these curious variations, it will be noticed, are different with different children; and, strange to say, these modifications will, in numerous instances, be as attractive to the pupils themselves as to the teacher —and, it may be added, will prove as inexplicable to both. All through this period the teacher should give short expositions of the system, and fully explain to his classes the vital importance of a perfect two-handed dexterity in every walk of life, in every trade, and in every profession, in every employment and in every recreation.

Let the pupils once realize that in rowing, swimming, gymnastics, fishing, cricketing, writing, drawing, painting, in piano-playing, in carpentry, wood-carving, smith-work, plumbing, bricklaying, stone-cutting, gardening, &c., Ambidextral skill increases their efficiency from 30 per

cent. to 50 per cent., and they will be as keen in the acquirement and application of two-handedness as the most ardent teacher can be in the encouragement and promotion of it.

The routine time-table should recognize the teaching of Ambidexterity in every possible subject. Inspectors should be instructed to accept nothing short of an exclusively two-handed scheme, and the reputation and reports of the efficiency of the school ought to take into consideration the degree of excellence which this Bimanual education has attained.

Periodical tests and examinations necessarily will be a prominent feature of the system, and nothing will have a happier effect upon the parents than occasional displays of the pupils' abilities as exhibited in public or semi-public meetings and demonstrations.

The several instructors in sewing, cookery, laundry-work, carpentry, &c., will supplement the ordinary school teaching by observing the same rigid impartiality with reference to the two hands;—so that whether using the needle, the saw, the plane, or the chisel, both hands will receive the same amount of attention and be given an equal amount of work. Five minutes, or even ten, might be allotted to lessons in throwing the cricket-ball with the left hand; always combining this practice with right-hand work as well, for purposes of comparison in style and distance.

Intensely exciting contests might be arranged at cricket, by two teams agreeing to both bat and bowl with the left hand all through a certain match. On the return match both teams might use the right hand in these two departments. Once more, the match could be varied by all on one side using their right hands, whilst all on the other used their left hand—of course only in batting and bowling, the fielding in every case to be with both hands as occasion demanded.

Then in the tennis courts the same ideas could be

carried out to the mutual advantage of all concerned—the principles being just as adaptable to ping-pong, badminton and other recreations, in games and tournaments.

The ordinary work of arithmetic should be done by the two hands alternately, all the class using the left hand one day and the right hand on the next. Regular practice in simultaneous figure-making, and in simultaneous writing down of questions, will evoke the greatest excitement and produce excellent results. Speed contests between the two hands may be conducted and encouraged, the innocent rivalry thus established proving a valuable stimulus. Another form of competition can be introduced to test the excellence of the work done by each hand respectively, and this will likewise lend material interest to the daily round. Blackboard practice and illustration ought not to be neglected, for the pupils will enter into the exercise with the keenest zest if the teacher allows the boys or girls to give at the blackboard demonstrations of their individual skill. Once a week will not be found too often for this kind of work. It will be wise also for the teacher to ascertain from the scholars whether they feel any greater difficulty in working arithmetical calculations when using the left hand than they do when using the right; the replies can then be tabulated for comparison with the actual percentage of correct answers obtained in the class exercises. Mirror-figuring with both hands together may present some little difficulty to the average class of juveniles, but it will not be any the less attractive or profitable to them. It may be safely taken two or three times a month. The time thus spent on such mirror-writing is by no means lost or wasted. The exercise is of considerable mental and educational value, as the teacher will discover if he only consistently practises it.

Reference has already been made to cooking, sewing, carving, modelling, carpentry and other school subjects; suffice it here to lay down the rule, that the several

instructors in those departments must aim at maintaining a perfect equality of both hands in every manual exercise that is taught in the classes.

The girls—every individual girl—must sew, knit, darn, mix, roll and cut the paste, mould and chisel with either hand indifferently, and with both hands equally. A series of most interesting comparisons may be instituted between the boys and the girls, both as to the rates of progress in each sex and also as to the character of the work done; whilst many phases of inquiry will open up as to the points of resemblance and of contrast, and the difficulties peculiar to each class.

These results should be carefully recorded by the teacher, so that any general survey of, or investigation into, the phenomena of Ambidextral development may have a sufficiency of reliable data to go upon for the purposes of averaging, estimating and tabulating, with a view to the introduction of modified or additional methods of instruction.

Then, again, the teacher should be on the alert to recognize and determine the effects of two-handed training upon weak-minded children; and here we are bold almost to presumption in predicting a very gratifying table of statistics; because we firmly believe that the Bimanual Exercises are calculated to be of great and permanent benefit to the unfortunate members of this too numerous class of juveniles. This belief is based on the admirable and astonishing work of Father Seguin in his treatment of the feeble-minded.

There will, and can, be no possible doubt as to the boon conferred by an Ambidextral Education upon pupils and students in our Technical Schools. Every handicraft must reap great advantages therefrom. On pages 239-242 we give a list of crafts, manual arts, and professions. Surely no one can glance over its columns without being struck with the fact that **in nearly every case** two-handed skill on the part of the artist, mechanic or labourer,

would increase his value to a material degree, and thus bestow a by no means insignificant benefaction upon the community at large.

Whether in designing, drawing, metal-working, or other employment, the instruction should enforce the rules and regulations already laid down for the other departments, giving each hand its due share of work, and devoting extra attention at all times to any individual hand that may display an inferior aptitude and sensibility to development.

Lastly, in the gymnasium, every exercise with wands, rings, clubs, dumb-bells, ladders, trapeze, ropes, singlestick, vaulting horse, horizontal and parallel bars, must be truly and essentially TWO-HANDED. It should be the ambition of every teacher to make his pupils as truly Bimanous as the Quadrumana are themselves with their two front or upper limbs; and that such an accomplishment would yield the most astonishing results in unequalled confidence and unapproachable agility, no one acquainted with the powers of the monkey tribe will for a moment dispute.

The Rifle Brigade must go through all the evolutions with the left hand just the same as with the right; and they will then soon be able to go through their drill with the left hand quite as smartly and efficiently as they can with their right. A volunteer or regular who can thus execute all the movements of gun and sword drill with either hand perfectly and independently, must surely be a far more valuable defender of his country than the man who can use only one hand, and even that one with an inferior degree of proficiency.

Ambidextral Instruction in schools, then, we take it, bids fair to become—in Mr. Noble Smith's pregnant if not prophetic words—"THE MOST VALUABLE INNOVATION IN TUITION OF THE AGE!"

CHAPTER II

AMBIDEXTRAL HANDWRITING

One may pardonably ask, "What do you mean by Two-handed Writing?" Is it that the writing has been, or is to be, done by either hand, or that it is the production of both hands? If the latter, did the hands do their work separately or simultaneously? This chapter is primarily intended to show that writing may be so taught that the individual is able to do it with either hand equally well; that he is also able to write the same exercise with both hands at the same time equally well; and, lastly, **that he is able to write different and unrelated matter at the same time with his two hands.**

It is an incontrovertible fact that "our organization permits us to write with equal facility from top down, from right to left, from left to right; no physiological condition has compelled us to choose a particular direction."

When we know that many millions of our fellows are at this moment actually writing in each of these three directions—the Japanese write from the top downwards; the Mohammedans from right to left; and Christians from left to right—the statement is unanswerable, and, so far as we know, the several millions who thus write in contrary and different directions, appear to find no difficulty whatever in their varying modes of work. It may be noticed that many persons entertain the idea that writing from left to right seems to argue right-handedness, but

it is a rule which, if accepted, will work both ways; hence it has been retorted:—"Assuming this to be the fact, then, since countless millions were writing from right to left and from the top downwards, centuries before left-to-right penmanship came into existence, we must conclude that those were left-handed people. If so, what were those nations who wrote from the top downwards? Were they right-handed, left-handed, or were they such perfect Ambidexters that they took the happy medium and thus favoured neither hand?"

Although Dr. Erlenmeyer has so earnestly striven to prove, by the most patient and able reasoning, that the Hebrews were left-handed, specially because of the direction of the writing of that ancient people, we fear that the Bible references (given on page 14), as also the whole trend of Scripture from cover to cover, are conclusive against his theory. The contention that either direction is the natural one—to the exclusion of the other two—is as unfounded as would be the assertion that it is more natural to look towards the right than towards the left, or to look up than to look down.

We have already referred to the importance of writing as an Ambidextral function, and this importance can hardly be over-estimated. The crystallization of thought into visible speech by means of the letters of the alphabet, is undoubtedly the most intelligent, complex, and by far the most precious discovery and development of civilization. Our hands can engage in no occupation of so intricate and intellectual a character. Moreover, writing enters into the lives of a larger number or proportion of the human (civilized) race than does any other subject in our school curriculum. Reading and arithmetic are its only rivals; and of these two, arithmetic retires from the contest of necessity; and with regard to writing, as Lord Palmerston very truly said, "Writing is almost as important as speaking." And if this is the fact, then, surely writing must be quite as important as reading can

possibly be. Such being the case, we are warranted in pushing our inquiries still further into the region of Ambidextral skill as exhibited in the art of handwriting.

Mr. G. V. Poore, in his "Nervous Affections of the Hand," very fully and accurately describes the act of writing as it affects or produced muscular action in the writer. As the subject is one of such supreme importance, his delineation is given almost unabridged :—

"Let us first consider the act of writing, an act practised in this country exclusively with the right hand, and which we learn to perform fluently only after many years of patient labour. We are none of us born writers, and the children of educated people do not learn the art with materially greater ease than the children of the uneducated. There is no evidence whatever, I think, that by constant practice of the art of writing we generate a faculty which is transmissible to succeeding generations.

"In writing, the pen has to be held with very great steadiness, and there are distinctly two acts involved in writing, viz. **pen-prehension** and **pen-movement.** The pen is kept steady (when the art is perfected) mainly by the intrinsic muscles of the hand, the interossei and the muscle of the ball of the thumb being chiefly employed. In order that these muscles may get a firm hold of the pen, the carpel and metacarpel bones must be held steady, and the wrist joint must also be fixed. This throws work on the muscles of the forearm. The elbow must be steady, and this throws work on the muscles of the arm. The shoulder and scapula must also be steady, and therefore the shoulder and thoracic muscles are brought into play. The trunk has to be kept firm, which involves contraction on the part of the spinal muscles, and in order that the pelvis may give a firm support to the spine, the legs have to be firmly fixed. There is scarcely a muscle in the body that is not brought into play in the act of writing, and if we watch a little child at its writing lesson, we generally see that it hitches one leg round the

leg of a chair in order to steady the pelvis and trunk, and so great is the muscular effort involved that the face muscles contract consentaneously, and the movements of the pen are, as often as not, followed by the tongue.

"The act of writing is primarily divisible into (1) the act of prehension, and (2) the act of moving the pen; and the act of moving may be again sub-divided into (a) the Stroke-making movement; (b) the movement of the hand from left to right; (c) from right to left; and lastly (d) the ink-dipping movement.

"Besides the act of prehension, there is (3) another muscular act, this is the poising of the forearm and hand, which is ordinarily kept about three-quarters prone, the hand being balanced upon the pisiform bone and little finger. Thus it will be seen that writing is divisible into three acts—the **prehension of the pen, the poising of the hand and forearm, and the movement of the pen**, and there is probably no muscle between the shoulder and the fingers which is not brought frequently into action during writing.

"The muscular action to which we wish to direct very particular attention is that of prehension. The pen is normally held between the thumb and the first two fingers. The thumb and index finger form an oval ring through which the penholder passes, being held by the distal and resting on the proximal end of the said oval. The distal ends of the metacarpal bones of the thumb and index fingers are widely separated; the first phalanx of the thumb is abducted; the phalangeal joint forms an angle which is more or less acute in different writers; and the pulps of the terminal phalanges of the thumb and index finger are, but for the intervention of the pen, almost directly opposed to each other. With regard to the first two fingers, the proximal phalanges are flexed, and the two terminal phalanges nearly straight. The muscles which keep the thumb and fingers in this attitude of prehension are, we believe, with one exception, **intrinsic**

muscles of the hand; in proof of which, if the rheophores of a faradising apparatus with big sponges be placed the one on the palmer surface of the hand between the thumb and index finger, and the other on the dorsal surface of the metacarpal bone of the index finger (so as to influence more or less the special muscles of the thumb and first two fingers) the thumb and first two fingers will assume an attitude of pen-prehension (saving only the flexing of the phalangeal joint of the thumb), and a pen held between them will be tightly grasped.

"The muscles chiefly concerned in the muscular act are, we believe, as follows:—The **interossei** of the first two fingers which flex their respective first phalanges (the dorsal muscles further helping the act of prehension by dragging the first two fingers towards the thumb): the **abductor pollicis,** which abducts the first phalanx, an action without which proper opposition of the pulps of the thumb and index finger would be impossible. The **opponens pollicis** and **flexor brevis pollicis**, as their names indicate, are also important muscles in the act of prehension. The phalangeal angle of the thumb is maintained, in a great measure—if not entirely—by the action of the **extensor primi internodii pollicis.**

"The muscular effort of **poising the hand** is thrown chiefly on the supinators. The hand is three-quarters prone, and in this position the weight of the hand tends to make pronation complete—a tendency which is checked by the supinator longus, the supinator brevis, and possibly the extensors of the thumb.

"The stroke-making movements are accomplished by the long flexor of the thumb, and the extensor secundi internodii, the flexor profundus digitorum, and the extensor communis digitorum. The up-strokes are in part dependent on an increased action of the interossei.

"The movement of the arm from left to right depends chiefly on the triceps extensor, and that from right to left

on the pectoralis. The muscles concerned on the ink-dipping movement scarcely require naming. . . .

"Further, as to the act of writing, it must be borne in mind that it is one of the most complicated possible, perhaps the most complicated muscular act which is ever performed by the body. The act of writing takes years of patient labour to acquire; and although children begin to learn very early in life, it is seldom before adult age is reached that their writing loses those evident marks of juvenility which we all know how to recognize. Perfect writing should be an act accomplished without effort, and almost without thought; or, in other words, it should be a purely automatic act, and one accomplished by an expenditure of mental stimulus so small that we can scarcely recognize it. For the accomplishment of the act of writing a very large number of muscles is required, and when we consider the light, yet firm grasp of the pen which is necessary, the poising of the hand in the semi-prone position, the stroke-making movements of the pen accomplished by the flexion and extension of the fingers, the travelling of the hand across the paper and back again, and the journey of the hand to the ink-pot; we see that nearly every muscle between the shoulder and the finger-tips is brought into play, and we cease to wonder that years are required for educating these muscles to work accurately and harmoniously together.

"There may or may not be a 'co-ordinating centre' whose function it is to control the act of writing; this is a matter of speculation. It is, however, tolerably certain that, should one or more of the muscles which have been so laboriously educated, exceed or fail in its work by an increased or diminished response to stimulation, the harmony of the complicated act of writing is interfered with, concord is converted into discord, more or less marked, and that which had become a purely automatic act by dint of years of study, relapses again into an act which requires a greater or less amount of attention."

On page 117 a passing reference has been made to the only practicable style of writing in Ambidextral training, whether the hands are working singly or together. And it is there assumed and asserted that vertical or upright writing alone lends itself to this two-handed exercise. Any slope of the letters, whether forward or backward, cannot be equally suitable for each hand. This is immediately evident. But the vertical style is precisely the same, optically and physiologically, whether produced by the right hand or by the left hand, as any one will find by sitting down with a pen or pencil in each hand and drawing a few perfectly upright straight strokes with each hand separately, and then with both hands together.

Now, since the crux of the whole question, and the result of the entire controversy, hinges on the subject of Ambidextral writing, it will not be out of place to conduct an investigation to determine, here and now, once for all, the superiority of upright penmanship from the Hygienic and the Calligraphic standpoints; so that no uncertainty may remain in the mind of the reader; and that he may be assured that the great consideration of "two-handedness" is not going to be promoted at the expense or sacrifice of a corresponding advantage in handwriting. Just the opposite! Furthermore, it is honestly believed that the most unbelieving and incredulous will be convinced by the evidence about to be brought forward that, not only is Ambidextral Science in itself a priceless boon to the community, but that the blessings it brings in its train—vertical writing being one of the most important—are of equal and lasting worth.

The author is aware that reference might be here made to such and such works where these advantages of vertical writing are fully set forth; but it is deemed best to present in this place an outline of the whole argument, that this Manual may be oomplete in itself as a perfect and comprehensive demonstration of the Ambidextral controversy.

First, then, as to the Hygienic value of upright penmanship as opposed to the incalculably injurious effects of slanting writing in its manifold and hydra-headed destructiveness. Special attention is directed to the independent, authoritative, and unanimous character of the evidence.

1. Writing in relation to the Spine.

Mr. Noble Smith, F.R.C.S. (Senior Surgeon, City Orthopædic Hospital, London), says, in the fourth edition of his well-known work on "Spinal Curvature":—"The twisted and curved position of the spine, caused by writing, is doubtless a very potent factor in the production of lateral curvature. The more slanting the writing the worse the position, and I would emphatically advise that upright be universally substituted for slanting writing" (p. 78). "The posture necessitated by ordinary writing is probably that which causes more harm to the spine than any other, but the system of upright writing so ably advocated by Mr. Jackson is calculated to reduce this harm to a minimum. I take the opportunity of advising the reader to obtain Mr. Jackson's publications upon this system of upright writing, with which I have become acquainted only since urging the advantages of substituting upright for slanting writing in the second edition of this book" (pp. 117 and 118).

Again, this gentleman writes, under date May 16th, 1889, as follows:—"In answer to your letter of May 12th, I write to say that since I first published some remarks upon the influence of slanting writing in the production of lateral curvature of the spine, in 1884, I have had no reason to alter my views. It is impossible for any pupil to write freely in a slanting manner without placing the spine in a crooked position, and in exactly the position which is most common in spinal curvature. Many a case of weak back could be easily cured were it not for the

effect of the frequent assumption of this one particular position. I have known a patient suffering from lateral curvature of the spine, who has been making rapid strides towards recovery, immediately relapse upon a resumption of school work,—such work involving a large amount of writing; and I HAVE CLEARLY TRACED THE WORST EFFECT TO THOSE SCHOOLS WHERE SLANTING WRITING IS TAUGHT."

Mr. J. Jackson Clarke, M.B. London, F.R.C.S. (Surgeon to the North-West London and City Orthopædic Hospitals), in his paper read at the British Medical Association Meeting, Ipswich, in August, 1900, observes:—"It is now well recognized that the great majority of cases of scoliosis arise from faulty attitudes adopted by school children during writing. Tilting of the pelvis is not a necessary, or even a very common, precursor of lateral curvature. . . . We must remember that for one case in which the deformity arises in this way, I believe there are fifty in which it arises from faulty writing postures." "British Medical Journal," September 1st, 1900.

Mr. Bernard Roth, F.R.C.S., in his "Lateral Curvature of the Spine,"—with an Appendix containing details of 1,000 cases,—second edition, 1899, has the following remarks:—"The position of writing, as generally practised, is more frequently than anything else an initial cause in most cases of lateral and other curvatures not due to diseased bone or infantile paralysis. This vicious posture during writing is due to the unfortunate custom of teaching a slanting writing, from left to right upwards obliquely. It is essential that not only the trunk, but also the arms, should remain perfectly symmetrical" (pp. 3, 4).

Mr. R. Liebrich, F.R.C.S. (late Consulting Ophthalmic Surgeon to St. Thomas's Hospital, London), asserts that:—"All authors agree in thinking that bad posture is the chief reason of this affection" (lateral curvature of the spine), "the abnormal posture of the children, especially



Position in Sloping Writing (front view). Position in Vertical Writing (front view).

Fig. 15.



Twisted position required and taught in Sloping Writing (back view).

Natural position required and taught in Vertical Writing (back view).

Fig. 16.

when writing, being the real cause of the evil"; that "the frequency of the so-called scoliosis or lateral curvature of the spine has its principal origin in the position in which the children sit during their school time, especially when writing"; and that "Lord Palmerston had asked the Government that the Italian handwriting might be discontinued in favour of the upright system. It is not easy to write the sloping handwriting in a hygienic position."

Dr. Eulenberg says that 90 per cent. of curvatures of the spine, not induced by local disease, are developed during school life. In one school, among 381 girls, 156 were found to have more or less deviation of the spinal column. These were sloping writers.

Dr. Schenk, in his "Actiology of Scoliose," Berlin, informs us, that having examined and measured 200 children who wrote the sloping style, he found 160 of them to be more or less affected with pronounced curvature of the spine.

Dr. Gross, Stuttgart, declares that the children's vicious attitudes are essentially the consequence of the unnatural sloping writing.

Professor A. Lorenz, Orthopædist, and Dr. Gouber, Commissioner of Health, in a combined report, assert that:—"Quite apart from all other advantages, the absolute superiority of this method of writing" (the vertical) "over other methods must be admitted," and conclude as follows:—"Vertical writing is very much to be preferred, from the Orthopædic point of view, to oblique writing; and has been recommended for a long time by many Orthopædic surgeons in private practice, with the best results for rendering the writing position a healthy one." And the following eminent Orthopædists:—

Mr. W. Adams, F.R.C.S., "Lateral Curvature of the Spine," 1882.

Mr. R. Barwell, F.R.C.S., "Causes and Treatment of Lateral Curvature," 1895.

Mr. B. E. Broadhurst, F.R.C.S., "Curvatures and Diseases of the Spine," 1888.

Mr. J. J. Clarke, F.R.C.S., "Orthopædic Surgery," 1899.

Dr. Percy G. Lewis, "Relief and Cure of Spinal Curvature," 1898.

Dr. M. Roth, "Spinal Deformities and Lateral Curvature," 1887.

Mr. A. H. Tubby, F.R.C.S., "Deformities, a Treatise on Orthopædic Surgery," 1896.

And many others, although they have not made a special study of the writing-posture question, refer to, and condemn in similar terms, these slanting-writing attitudes as follow:—

"The sitting position during education, specially for writing."

"The curve caused by the writing position."

"Particularly fruitful of deformity are the faulty positions assumed during writing."

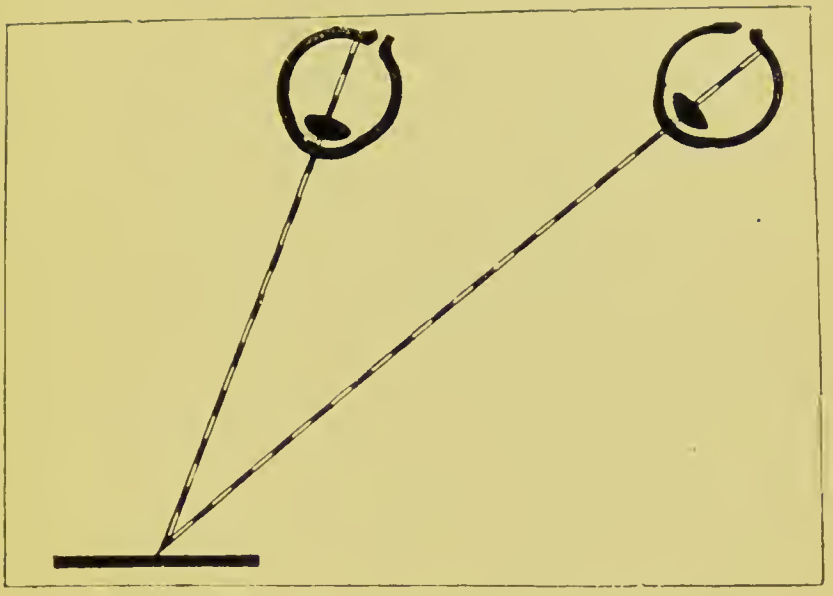
"The vicious writing posture."

"The very absurd position they are forced to assume in learning to write the Italian hand," &c., &c.

2. Writing in relation to the Eyes.

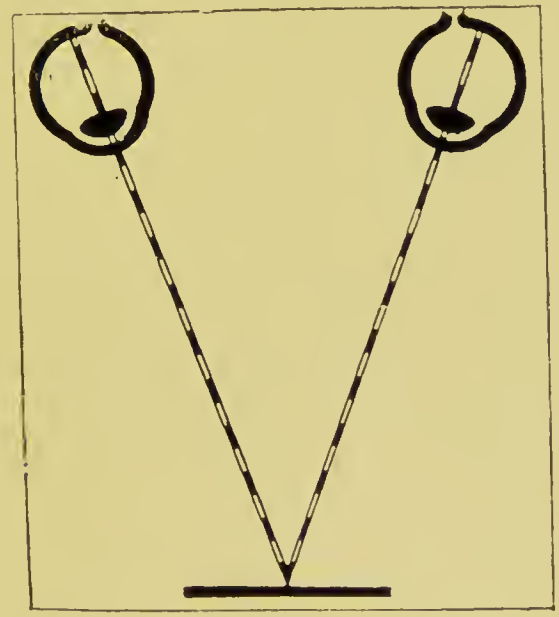
Mr. Simeon Snell, F.R.C.S., in his able treatise on "Eyesight and School Life," observes:—"I am satisfied that for the objects one has in view of obviating sight failure, the upright is to be preferred to the slanting method. From an oculist's point of view there are distinct advantages in the vertical method of writing. The eyes are directed straight to the copy, whilst in the sloping method there is a great tendency to assume a slanting look with the eyes."

Dr. Hermann Cohn, of Breslau, says, in his notable work on "The Hygiene of the Eyes":—"I abide by the opinion I expressed ten years ago, 'Undoubtedly



[[Uneven position of the eyes in Sloping Writing (from Bayr).

Fig. 17.



Natural position of the eyes in Vertical Writing (from Bayr).

Fig. 18.

VERTICAL WRITING IS THE WRITING OF THE FUTURE.' No one, speaking from the physician's point of view, has declared himself against this writing."

Professor Dr. P. Schubert, Oculist and Specialist, of Nurnberg, Drs. Schmeller, Hahnel, Berlin, Florschutz, Remboldt, Schmidt-Rimpler, Segget, Emmet and others, who examined no less than 21,949 children, found that sloping writing caused the head to hang down on one side, giving an uneven view of the writing, and producing, in hundreds of cases, Myopia and weak sight.

Professor Dr. A. von Reuss (Professor of Ophthalmology, the University, Vienna), in his report to the council, concludes with these words:—"It is therefore strongly recommended that the Imperial and Royal Supreme Council of Health would support to the utmost the endeavours towards a general adoption of vertical writing."

3. Writing in relation to the General Health.

In the discussion that followed a lecture by Dr. Liebrich, the chairman, W. B. Richardson, M.D., F.R.S., remarked that "The mischief did not rest at the spinal column, it went far deeper." He saw "The daily results extending to the lung itself. So soon as the condition shown was set up, there was a modification of the process of breathing—a want of elasticity—and the results, congestion of the lung, the reducing of the quantity of the blood, liability to take cold on the slightest occasion, and the development of phthisis. We get, with the impaired health, impaired digestion, dyspepsia, and that feebleness which arises from it, and which marks so many schoolrooms. The effects of the way of sitting in schools cannot be shaken off, for people grow up and become fixed in them." He had "seen diseases hastened and increased by the pressure of sitting in the position which use had made natural."

The Ninth International Congress of Hygiene and Demography, London, 1901, passed the following resolution after two papers and a discussion, in which every speaker, including Prof. Gladstone, declared in favour of vertical writing:—"That as the hygienic advantages of vertical writing have been clearly demonstrated and established, both by medical investigation and by practical experiment, and that, as by its adoption the injurious postures so productive of spinal curvature and short sight are to a very great extent avoided, IT IS HEREBY RECOMMENDED THAT UPRIGHT PENMANSHIP BE INTRODUCED AND GENERALLY TAUGHT IN OUR ELEMENTARY AND SECONDARY SCHOOLS."

This consensus of medical talent, then, agrees in condemning sloping writing—either in itself or in its immediate and inseparable effects—as abnormal, faulty, harmful, injurious, absurd, mischievous, and vicious, whilst it recommends the adoption of vertical writing as being free from all such undesirable influences and baleful consequences.

The hygienic value, then, of vertical writing may be considered as proved.

4. Writing in relation to Legibility.

That upright penmanship is extremely legible, that it is the most legible form of writing possible, and that it is far and away more legible than any kind of sloping writing, are facts that no rational person nowadays dares to dispute. Roman type is more readable than italics, or we should have our literature printed in the slanting letter. It does not require argument to prove this almost axiomatic truth, but we give one or two illustrations that will speak conclusively, and also reproduce the testimony of some who have tested the question for themselves.

Legibility, it must not be forgotten, is the primary essential of good writing, and if so, the most cursory

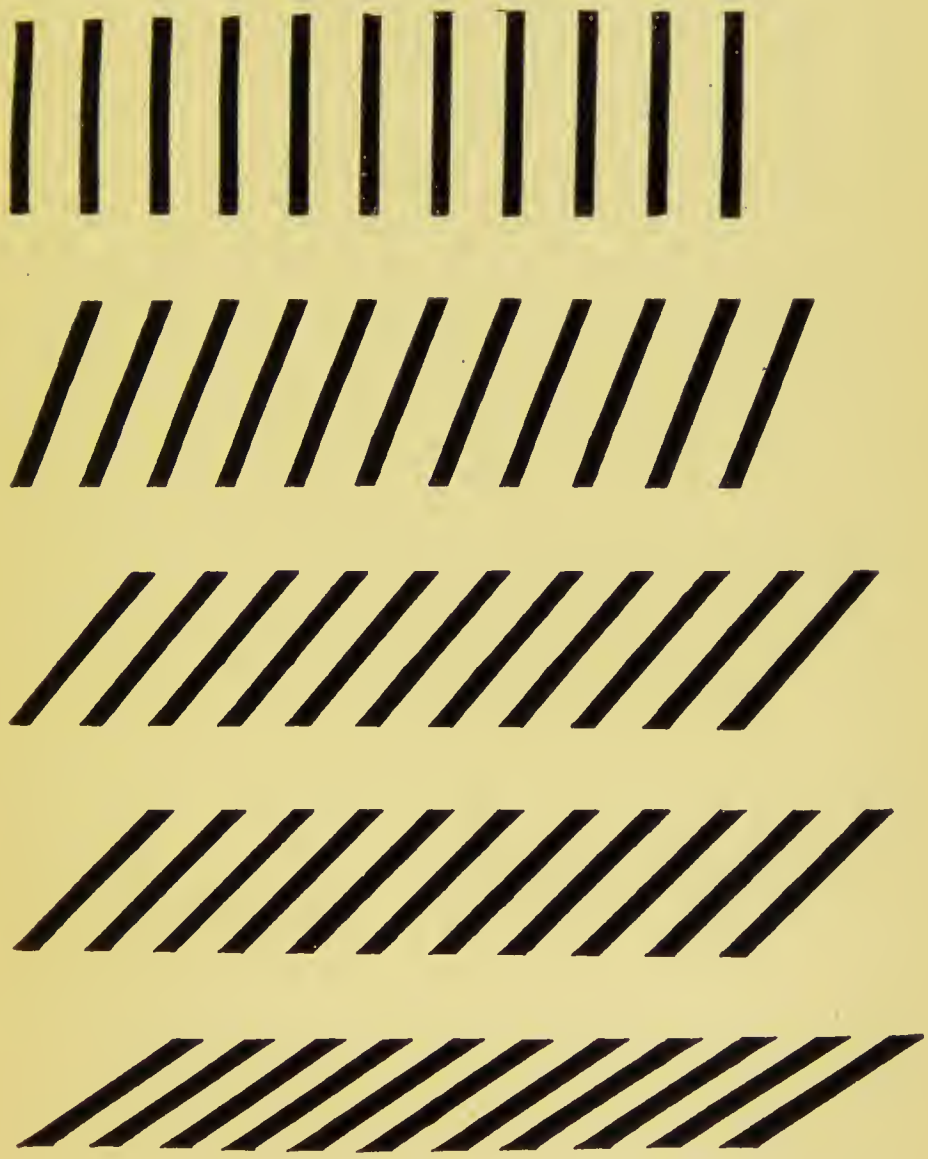
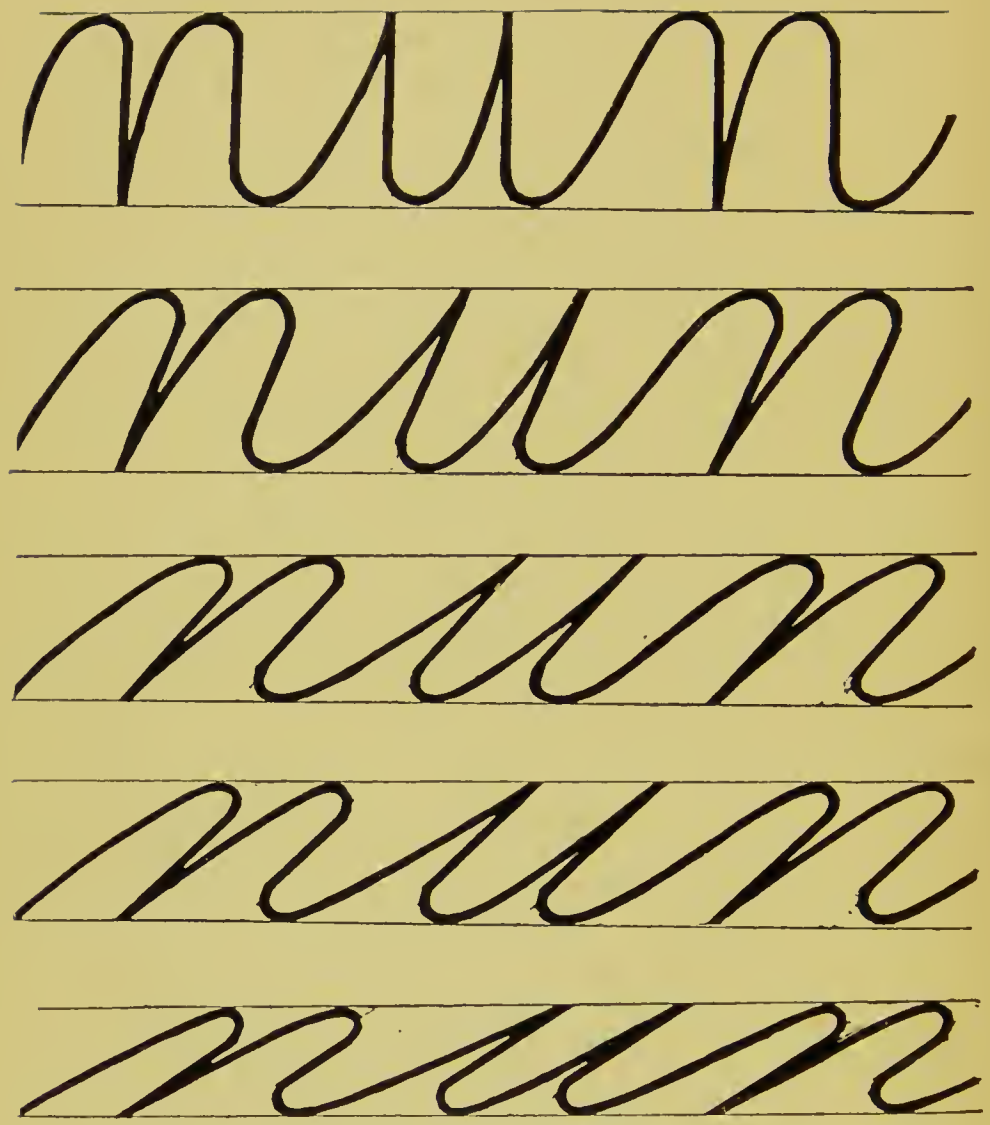


Fig. 19.



All the corresponding strokes are as nearly equal in length as the curvature and varying slopes of the letters will permit.

Fig. 20.

glance at the diagrams should satisfy the most incredulous that VERTICALITY is necessarily the maximum of plainness and readableness.

In fig. 19 there are five rows of right lines, eleven in each row. What is the idea conveyed by them?

Is it not that the lines in the lowest rank are shorter than the others, that they are thicker than the others, and that they are drawn closer together? Does it not seem as if the lines grow longer, thinner, and wider apart as we travel upwards, i.e. that the lines in the top row, for example, are drawn from base-points farther apart? These are optical delusions caused by the slope of the strokes, as all of the lines, in the large sheet from which the diagram was photographed, were drawn of **exactly** equal length and thickness, and from base-points exactly equidistant from each other. Let the reader fix his eyes on either of the two figures 19, 20, and, gradually retiring therefrom, let him note the striking difference between the upright strokes and the sloping strokes in clearness and legibility. This optical test is unanswerable and final.

Only one authority shall be quoted, but the testimony is typical of what can be called universal experience.

Mr. Hodgson, H.M.I., New Zealand, reports as follows in the Blue Book:—"Nearly as legible as print. As an examiner, part of whose duty it has been to read rapidly thousands of schoolboy papers, I feel entitled to speak with confidence as to the relief to overtaxed eyesight afforded by the new style of vertical writing."

5. WRITING IN RELATION TO SPEED.

VERTICAL writing is the most rapid style of penmanship possible, and certainly more quickly executed than any form of slanting writing can be UNDER THE SAME CONDITIONS. Here again we have two witnesses—actual measurement and actual experiment.

trained eye can accurately determine and much less constantly maintain? Experience supplies the answer, and we have the admission from many opponents of the upright hand to that effect.

A well-known professor of penmanship in the United States of America remarks in an elaborate essay:—"I have observed one thing in teaching children in the first grade to write, THEY NATURALLY WANT TO WRITE THE VERTICAL HAND; it has been my observation that YOU HAVE TO TEACH A CHILD SLANT." Slope is the UNKNOWN QUANTITY in handwriting, the mysterious x of a very perplexing problem to which every pupil finds his own independent solution. Indeed every teacher of slanting writing knows that the bugbear of this oblique penmanship is the impossibility of attaining this much-to-be-desired regularity of slope; in fact it is never secured, and teachers weary themselves all through their lives to obtain it.

That vertical writing is easier and more natural for the ordinary penman than any sort of slanting calligraphy has been clearly shown in the section treating on hygiene.

7. WRITING IN RELATION TO ECONOMY, ETC.

Sloping writing is an extravagant style to adopt. It SPRAWLS all along the lines in the most wasteful manner; whereas vertical writing is compact, and economical to an extreme. Since upright penmanship can be written so much more quickly than sloping, it saves time; and as it is written more closely together it saves space and paper; therefore it saves ink, and, what is more valuable, labour or muscular effort. We need hardly in this place refer at large to the pedagogical advantages of the upright style. That they are many and great goes without saying; and those interested in the question will find the whole argument fully discussed in "THE THEORY AND PRACTICE OF HANDWRITING," fourth edition.

Generally, then, and finally, it may be taken for granted :—

1. That vertical writing avoids all the serious and unhealthy conditions and consequences inseparable from every form of slanting writing, and that it is the only safe and hygienic style of writing available.

2. That it is indefinitely more legible than oblique writing.

3. That it is far more rapidly executed than slanting writing.

4. That it is the only natural style of writing.

5. That it is much more easily taught, learned, and produced than slanting styles.

6. That it is most economical and time-saving, and

7. That in a pedagogical sense it possesses many and great advantages utterly unattainable by any sort of sloping writing.

As a note to the above argument, it may be added that the accumulated evidence from many hundreds of school-inspectors and teachers, spontaneously offered, over a period of some fifteen to twenty years, unanimously corroborates each of the above seven points, as illustrated in the uniform results of their own observation and practice with children of both sexes, both colours, and in every grade of school.

After this long, but relevant, digression on vertical writing, we resume the subject of Bimanual Instruction. In doing so, we advocate the greatest thoroughness and enthusiasm in the teaching of simultaneous two-handed writing. Once let our children be able to write equally well and rapidly with both hands, separately and concurrently, and Ambidexterity in its best sense is practically secured. When properly conducted, the writing hour will be the most interesting and attractive of the whole day, and moreover it will be most fertile in results. Such opportunities are afforded for artistic skill, calligraphic

dexterity, competitive exercises, psychological experiments, dual developments, and absolutely novel exhibitions of mental and manual powers, that both scholars and teachers alike will enjoy the intellectual treat. The continual and surprising discoveries of new faculties will be a wonderful incentive to still greater efforts ; and when or where the limit of these latent possibilities will be reached it is impossible to say.

In all the writing classes, and in all the lessons where writing forms part of the class work, there must be, FROM THE VERY FIRST, the most impartial employment and encouragement of both hands; and of both hands SIMULTANEOUSLY whenever copy-books are being used. The system pursued must be so perfect that the pupils shall become saturated with the conviction that the two hands are co-equal in every respect, and are expected to take an equal share in all the duties and functions of their busy lives. Once let our boys and girls survey their hands in the same way as they look upon their eyes, ears, and feet—so far as identity of powers and responsibilities goes—and the results will be of the happiest kind.

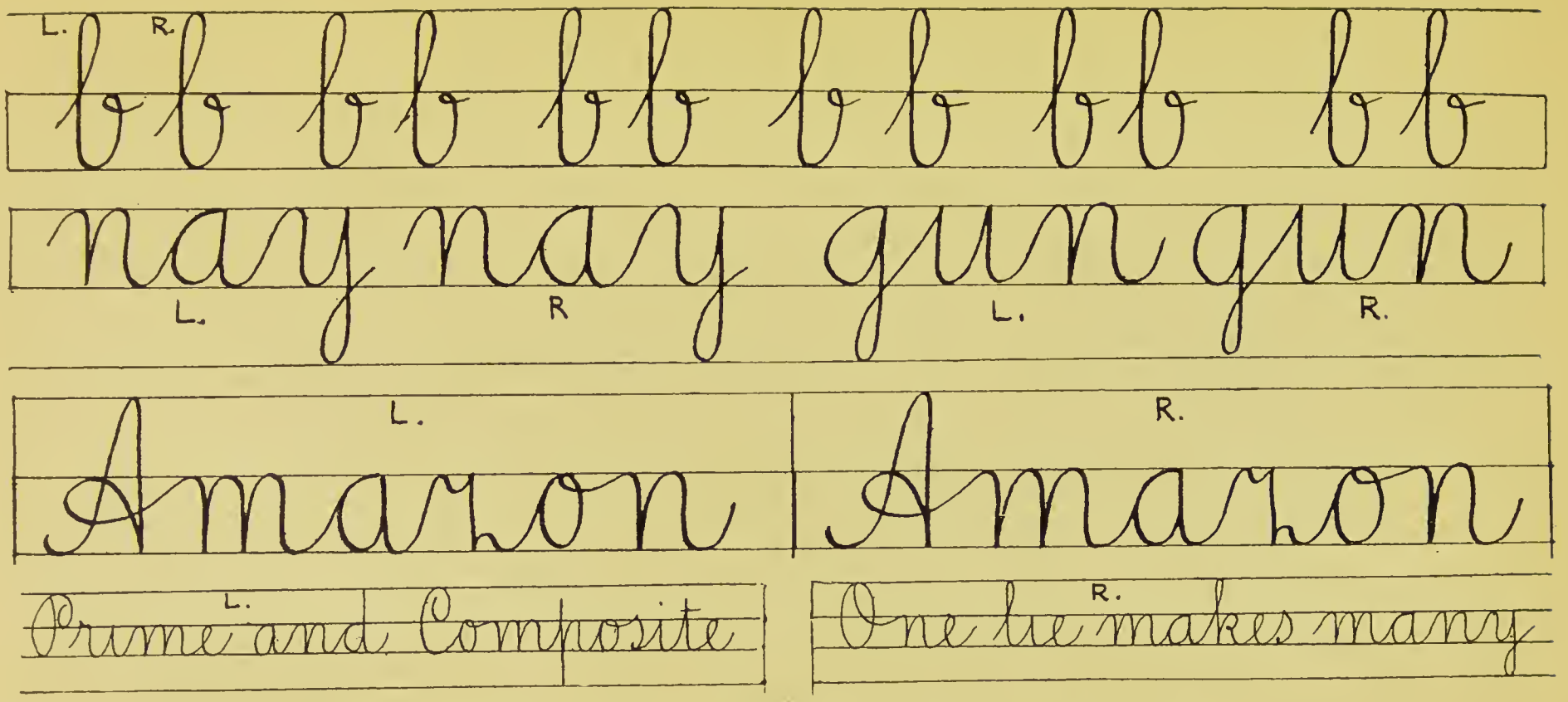
We crave forgiveness for the frequent repetition of this urgency and necessity; because our scheme is such an entire reversal of all that has hitherto prevailed in the arena of school life, that the danger of only half measures is both great and imminent. As will be admitted, there is the widest gulf between an unqualified distinction and differentiation—as now obtaining—and the total absence of that distinction; between the total neglect of the left hand and the most solicitous culture of it as here recommended.

It is necessary, then, that both hands should be started on the calligraphic campaign SIMULTANEOUSLY FROM THE FIRST LESSON, beginning of course with the right line, vertically and obliquely in both directions. The circle, and the oval will follow as demanded.

Where grooved tablets are not used it will be better to have chalk with pasteboards, to be supplemented by class practice on the blackboard. After the infants have mastered the "similar motion" exercises, the "contrary motion" element may be introduced into each of the initial outlines in order from the straight stroke to the oval; the same principles being continued through the whole of the alphabetical forms. The teacher, keeping the one object ever in view, viz. the acquirement by the pupils of "absolute independency" of action with the two hands when working together—will not fail to supply his classes with a profusion of combinations of letters and figures to be written coincidently. These exercises will possibly at the outset create no little diversion amongst the tiny scribes, but after the novelty has worn off, every shade of difficulty to acquire the independency of action will vanish, and it will be found that Ambidextrous simultaneous employment of the hands is considered quite natural, ordinary and proper. A complete graduated series of copy-books for instruction and practice in simultaneous two-handed writing has been compiled, wherein the methodical blending of similar and dissimilar forms is introduced in the first number and maintained to the last. A few typical examples of such headlines are here supplied (fig. 22).

The next stage introduces the writing of words, beginning with the shortest possible combinations. It will not be found difficult for the scholars to accomplish the simultaneous writing of such words as "it," "in," "on," and the like; nor will longer words be found less easy to trace as they come along. Naturally, in every case of a new idea being given, the pupils will write at first the same word simultaneously, before writing different words.

Interspersed with copy-book and black-board practice there should be supplementary exercises in blindfold writing, in the first case of the same matter, and lastly of different wording. The pupils should be encouraged in



Specimen Headlines in Copy-books for Simultaneous Two-handed Writing (natural size).

Fig. 22.

the effort to see their work MENTALLY, this will develop the power of visualization and greatly further the object of the teacher.

Accompanying this there will likewise be promiscuous exercises—graded in difficulty, of course—in simultaneous writing of dissimilar memory matter, and in the execution of different kinds of work, as writing a well-known verse or line with one hand and producing a row of figures with the other. Then easy examples of writing and drawing (concurrently) may be introduced, culminating finally in the writing of two different compositions at the same time, say two disconnected letters to two different people, as in figs. 13 and 14.

Common sense and parity of reasoning, as we have before observed, will show how easy it will be to turn out children just as capable of writing simultaneously two pieces of dissimilar penmanship as it is to teach pupils to play two different staves of music at the same time; but more, we maintain that by the method herein set forth the calligraphic scholars will far exceed in executive ability their musical rivals (i.e. according to present standards).

The grand result, therefore, of such a scheme of calligraphic Ambidextral Culture will undoubtedly be, to so train our school-children that they shall become adepts in simultaneous bimanual work (not only in penmanship, but in every occupation that they can undertake), that each hand shall be absolutely independent of the other in the production OF ANY KIND OF WORK whatever; that, if required, one hand shall be writing an original letter, and the other hand shall be playing the piano; one hand shall be engaged in writing phonography, and the other in making a pen-and-ink sketch, and this, be it remembered, with no diminution in the power of concentration when only one hand may be employed and one act demand the combined attention and energies of the two brain hemispheres.

CHAPTER III

AMBIDEXTRAL DRAWING, ETC.

THERE are at the present time (1904) so many text-books on Bimanual Art and Bimanual Training in Drawing, that the most modest contribution to the subject in this work might well be deemed a superfluity. As, however, the intention of the author in this place is so utterly different from that of the writers aforesaid, he feels more than justified in devoting some little time and care to its investigation.

Professor Tadd, in his "New Methods in Education" and Mr. Lydon in his school manuals, may be referred to as types—and to these gentlemen the author's indebtedness is here acknowledged. But it will be found that Ambidexterity in those productions is made the handmaid of art; whereas in the pages now before the reader, art, drawing, writing, and every other manual occupation are made the handmaids of Ambidexterity. Not that we do not devoutly hope that all our children and students may become pre-eminent in each and every handicraft and profession they may respectively adopt—that goes without saying—but **still more** do we desire that all our pupils shall become, in the strictest sense of the word, as two-handed in skill as they are in structure; for then—AND NOT TILL THEN—can they become, in the highest degree, proficient in every department of handiwork.

Speaking generally, drawing has not hitherto been taught in the United Kingdom, copying has. The charge brought by Professor Tadd against the so-called art-

training " hitherto obtaining in Great Britain is unfortunately too true; and we are also very much inclined to go the whole way with him in his denunciation of the extravagant claims that are " made for Sloyd, and several similar narrow mechanical methods." From observation and experiment, he found that " not more than 4 per cent. of the drawing teachers, who were tested, could draw—I mean draw as a mode of expression, delineate what they thought—I found only eight cases, out of several hundred, that had facility of hand—I mean the kind of elementary facility required in this book from children. . . . Almost invariably there was absence of proficiency in organic drawing, and, considering the time they had given to the work, their imitation drawing was feeble beyond the power of words to express."

The Professor does not so much censure the teachers, for he goes on to say—and we think with great appositeness and force:—" I am inclined to lay more blame upon the inventors of certain systems, who are never artists, who are backed by publishing firms, and whose chief idea is to sell books and materials Some of the systems claim that their books and materials do away with the necessity of the teachers being able to draw, and that instruction can be imparted in an easy and ready fashion by means of these equipments. And so the game goes on at the expense of the children! "

Surely if our English art teachers resemble their cousins across the water (for the above remarks apply directly only to Americans), there is abundant reason for a general quickening among the dry bones. Doubtless there is, even in England, great need and ample room for improvement in art teaching with special reference to drawing; but we are of opinion that the turn of the tide has come, and the next few years will witness a complete revolution in our system of education in art. AMBIDEXTRAL DEVELOPMENT will be the secret of this revival.

This chapter is not intended to be an exhaustive manual of art training; nor is its object to supply a complete scheme of drawing lessons or an equally comprehensive series of drawing copies; but it is purposed to clearly set forth more particularly that Ambidextral drawing and art are the only real true artistic education on the one hand, and to indicate how this artistic two-handed skill may best be attained on the other.

Tadd says that "Drawing should be used as modes of thought expression quite as often and as much as speech and writing; for while pupils gain accuracy of perception, they also gain facility of expression, the terms interacting."

The Professor is an enthusiast who indulges rather freely in exaggerated ideas and language. It is undoubtedly essential that drawing should be employed along with speech and writing in the expression of thought; and it is exactly on this crux that the difference between an artist and a copyist comes in. The manual training, then, that should be imparted, is that which aims at the highest development of the individual: cultivating and perfecting, as Mr. Tadd has it:—

1. The art of building ideas by using most of the channels of expression and most of the means of expression.

2. Accurate perceptive powers.

3. Facility of expression, not only in writing and verbally, but in a variety of ways through the hands.

4. Strengthening of thought fabric and mind structure, and capacity to use the same.

5. Most skill in the shortest space of time.

6. Fitness for the greatest number of fundamental operations or pursuits.

With reference to the first of these essentials, the means of expression have hitherto, in the departments of both art and labour, been confined, as far as possible, to one hand, and that the right hand, as we know from common

experience; but Mr. Tadd recognizes the secret of all **true** expression work when he allocates to the left hand, as he does all through his school course, an equal responsibility, and an equal share in the education.

Art, in the branches of drawing and manual training, are really "modes of getting ideas first hand, and giving ideas "first hand;"—shall we add, they are the best modes also? They effect the most perfect "union of thought and action," and they constitute the only complete preparation for the real work of life,—and as the enthusiastic Hailman observes, they "render lucid the latent spiritualities of matter, and enhance the utilities of life by clothing them with beauty."

Generally, the methods to be followed in an art course are "AMBIDEXTERITY, PSYCHO-PHYSICAL CO-ORDINATIONS, AND MEMORY WORK," together with many subsidiary adjuncts.

We will take the first of these, and hear what our exponent of bidextral art and manual work has to say after his twelve years' teaching of it in the large Philadelphian school:—

"Improvement is also made in other directions. The co-ordinating of one set of muscles invariably influences the rest. The hands, the eyes and the mind are exercised to a much greater degree than is possible when using them only partially, hence a more symmetrical whole is produced. . . .

"A little thought makes one realize that in many trades, especially the ones requiring skill of hand, both hands need to be used; AND THE MORE SKILLED THE LEFT HAND, THE BETTER THE WORKMAN. . . .

"If I work with my right hand, I use the left side of the brain; if I employ the left hand, I use the right side of the brain. In truth, I exercise some special region or centre of the brain in every conscious movement I make; and in every change of movement I bring into play some other centre. If, by performing any such action with energy

and precision, I aid in the development of the accordant centre, I am improving the cerebral organism, and building for myself a better and more symmetrical fabric.

"Muscular co-ordinations, and facility with the left hand as well as the right, are therefore very important, and of large application, apart from the physiological and mental value of Ambidexterity. Surely, then, the new education must not make the mistake of training but one hand, one only of these two instruments of power and action.

"'Every impression of sense upon the brain, every current of molecular activity from one to another part of the brain, every cerebral reaction which passes into muscular movement, leaves behind it some modification of the nerve elements concerned in its function, some after-effect, or, so to speak, memory of itself in them which renders its reproduction an easier matter; the more easy the oftener it has been repeated, and makes it impossible to say that, however trivial, it shall not under some circumstances recur. Let the excitation take place in one of two nerve-cells lying side by side, and between which there was not any original specific difference; there will be ever afterward a difference between them. This physiological process, whatever be its nature, is the physical basis of memory, and IT IS THE FOUNDATION OF THE DEVELOPMENT OF ALL OUR MENTAL FUNCTIONS.'" (Maudsley.)

Meissonier had very exalted notions of the value of drawing as one of the bases of primary education, and he exclaims:—"To what heights might their intelligences be trained by simply teaching them to see! I would have drawing made the basis of education in all schools. It is the only language that can express all things" (!) "An outline, even if ill-shaped, conveys a more exact idea of a thing than the most harmonious sentences in the world. Drawing is absolute truth, and the language of truth should be taught everywhere!"

This panegyric we will not disturb by criticism. There is so much of truth in its sentiments that the little excess of enthusiasm may be condoned. Sir Charles Bell's pronouncement, however, we can unhesitatingly endorse where he affirms that "The great source of happiness is to be found in the exercise of our talents, and perhaps the greatest of all is when the ingenuity of the mind is exercised in the dexterous employment of the hands."

Throughout the drawing course, blackboard free-arm work must accompany pencil and hand work; and simultaneous exercises must form no inconsiderable part of the pupil's training. IT IS OF THE HIGHEST MOMENT THAT FROM THE VERY COMMENCEMENT THE TWO HANDS SHALL LEARN BOTH CO-OPERATION AND INDEPENDENCE.

Drill forms should be carefully graduated from the introductory circle (IN ALL SIZES) up to the more difficult ellipses, double curves, spirals, leaves and other forms. These will constitute an inseparable adjunct to nature-sketching, which likewise begins with the simplest objects. A suggestive series of elementary units or outlines is here given.

The great value of drill-forms is to create and secure an automatic accuracy and freedom without which no real success in drawing can be assured. It is an essential that we draw every required outline and design mechanically, as it is that we write mechanically, as it is that we walk mechanically; and surely these two latter movements are never perfect until they are absolutely automatic. It is then, and only then, that the creative faculty and the imitative faculty can be exercised with any hope of a perfect result. AUTOMATICISM IS THE SECRET OF ALL SUCCESS, AS WELL IN DRAWING AS IN WRITING AND WALKING!! Mr. Tadd insists upon this where he remarks:—"The different movements must be practised till they are drawn with as little effort, and as unconsciously, as are the letters of the alphabet. No special talent or genius is necessary in order to be able

to write well. The same is true of drawing in the mere acquisition of the mechanical part of the work. Talent and genius are required for the higher grades of design and creative work, just as talent and genius are required to express great thoughts in written words. Especial care must be given to the left hand, owing to the lack of its use with the majority of people. But with the young the left hand can be made to work with as much freedom as the right, and I see no reason why any of us should not have as much control and power over the left hand as we have over the right."

But these drill forms do more than merely produce automatic accuracy and freedom of action. They secure WHAT IS EQUALLY ESSENTIAL TO SUCCESS, viz. perfect independence of movement in the two hands; a faculty which is lost sight of by most and possessed by few, but which may easily become the property of every one!

Naturally these forms must insure dissimilar, equally with similar, movements of the two hands simultaneously; for the secret of all independence lies in the unrelated character of the concurrent exercises that are practised and persevered in.

Pupils should be encouraged from the beginning to practise original drawing or designing; for, first, there is no child so dull or bereft of power in this respect as to be unable to produce something that shall have a tinge of originality about it; and, second, there is no part of the course that will afford more pleasure to the children with an equal amount of benefit.

Those readers who wish to follow this subject in its several departments of designing, wood-carving, and clay-modelling in all grades and ramifications, are referred to Mr. Tadd's book, where the whole matter is fully elaborated. The manual is profusely illustrated with most helpful and appropriate diagrams, and reproductions of photographs of pupils actually at work in every stage of the course. However strongly the reader may

differ with Mr. Tadd in some respects, a perusal of his methods and an acquaintance with his principles cannot but prove both interesting and profitable.

MEMORY-DRAWING will be found of great assistance in the development of the child; in fact it is one of the most useful of our appliances for expanding the mind and imparting artistic ability. This method should not be confined to life forms, but must include simple figures, conventionalized forms, and original designs; so the faculty of VISUALIZATION will be created, fostered, and perfected, that is, so far as the powers of each pupil respectively will permit.

We have now indicated, very superficially, it is true, but we hope with sufficient definiteness, the general character and trend of Ambidextral art-teaching in schools, with respect to the particular subject of drawing From the art-teacher's point of view, his object is to produce living artists: from the educationalist's point of view the object is to make LIVING MEN! If it be a matter of grave import to accomplish the former, how much more necessary is it to achieve the latter? This art-culture is but a small part of the general scheme of education that shall secure the highest percentage of perfectly developed, organized, and intelligent youth, ready and fully qualified to take its part in the several domains of life's industry. Let the principles just enunciated be faithfully carried out in this and every other branch of the school curriculum, and both of these essential objects will be reached; the art-teacher will get his artist, and the educationalist will as assuredly get his man; the one an able and truthful delineator of nature, the other an adolescent microcosm.

We cannot refrain, in closing, from repeating that in each stage of this art-study there must be no preferential use of either hand. Maximum results can only be got by PERFECT HANDICRAFT OR TWO-HANDEDNESS, and it is most encouraging to know that this ambidextral element is so rapidly coming to the front and being recognized as the

one great guarantee of success. It is even still more gratifying to learn that in every case the cultivation of the two hands has been followed by the most surprising quickening of the entire personality of the children.

The examples of left-hand drawing here supplied are, we take it, unanswerable proofs of the value of Ambidextral Culture, for they have been produced under peculiarly disadvantageous conditions. (Figs. 23 and 24.)

The pupils have not had the advantage of any comprehensive scheme of bimanual training; they have been subject to all the influences and restrictions of a unidextral environment; and they have not even been taught ambidextral art from their earliest years;—a year or two, at the most three, of left-handed practice in drawing being the sum total of their two-handed education.

AND YET THE WORK IS PRACTICALLY EQUAL TO ANYTHING DONE BY THE RIGHT HAND!

Surely every one will admit that this is a conclusive demonstration of sinistral skill and of the incalculable advantages of Ambidexterity!



Age of pupil, sixteen years

Fig. 23.

Left-hand Drawing.



Age of pupil, fourteen years.

Fig. 24.

CHAPTER IV

TWO-HANDEDNESS IN HANDICRAFTS AND TRADES

If Ambidexterity were intended merely to add zest to school work, to enhance the value of education, to shorten the period of school life—i.e. if the advantages of a general training in two-handedness were thus limited to the educational arena—it would more than justify its adoption, and repay handsomely any small amount of extra effort that had been expended in its promotion and consummation. Fortunately, more than this is the case. The benefits accruing from our proposed innovation are indeed only to be found developed in all their maturity and importance OUTSIDE the school, and amid the multifarious occupations and walks of after-life; in fact, amongst the professions, arts, trades, and handicrafts that give employment to the great mass of the people—to the muscles and sinews of the nation. Of the FIVE HUNDRED (and there are many others not there enumerated) occupations and pastimes tabulated on pages 239-242, there is scarcely one in which a perfect Ambidexterity would not be a distinct help and advantage; whilst in some 85 to 90 per cent. the faculty would prove of the utmost service, beneficial alike to the worker and the work. In a considerable number of these crafts, two-handedness is absolutely essential, and has always been part and parcel of the function itself, which, it may safely be said, could not exist apart from this inseparable property. Roughly speaking, there are not less than

thirty employments in which—as in the typical case of piano-playing—actual and equal two-handedness is practised of necessity; there are about 400 in which a perfect two-handedness would insure a wonderful superiority; and in the remaining few, only 10 per cent. of the whole, at the outside, an expert left hand would supply sensible relief and comfort.

The oftener one reads over this list of trades, &c., the more forcibly one is impressed with the desirability of expediting the reign of a universal two-handedness; for the loss to the nation (the physical loss, the mental loss, the financial loss, the loss in prestige, in time, and even in moral strength) is calamitous in extent, and is indeed irreparable. The waste in brain matter and in brain culture especially is lamentable to a degree, and who can tell how many Solomons, Bacons, Elizabeths, and other great intellects, are being lost in every generation? That co-ordinated brain culture, fostered and perfected by two-handed dexterity and development, would materially raise the standards of physical and intellectual excellence, there is little, if any reason, to doubt; and all these related blessings and benefits would be insured without the drawback of a single known disadvantage.

If we direct our attention, for example, to any particular class or kind of handicraft, and ascertain to what extent two-handedness is a benefit, we shall be surprisingly gratified. Take one of the minor trades—the carpet industry—as a specimen.

We have here carpet-weavers, carpet-sewers, and carpet-layers. In each of these departments two-handedness would mean, not only much greater efficiency, and consequently, superior workmanship, but the greater boon of a wonderful diminution in the physical ills which are inseparable from the one-handed worker, such as carpet-sewers' cramp, from which so many unfortunate victims suffer.

Once more, in the hundred-and-one occupations of the file, cutlery, and hardware industry, those only who are acquainted with the demands made upon human endurance, and with the great proportion of workers who succumb to the strain of one-handed labour in file-cutting, knife-grinding, riveting, &c., &c., *ad infinitum*, can appreciate the inestimable value of such an innovation as this scheme contemplates, and the relief it proposes to bring to overstrained muscles, aching backs, and exhausted brains. "One-handed labour in file-cutting," means, of course, the continual unchanged use of the hammer by the ONE right (or dextral) hand, and the total absence of alternate use in the tools that necessarily engage both hands simultaneously during the execution of the work in that, or any other, occupation.

Ambidexterity will be, to countless thousands of our artizans, a perfect Godsend, that nothing else can provide and that nothing else can approach unto. So, we shall get better work and better workmen, longer and stronger lives, improved health, and therewith brighter and happier homes than can be obtained under existing conditions.

Universal two-handedness is the leaven that will permeate every home and every section of the community; that will shed its beneficent rays upon and extend its priceless privileges to every class, to every individual, and to every interest of humanity. It must be so, it cannot be otherwise, else physiology, hygiene, logic, nature, common sense, and unanimous experience are alike misleading and unreliable.

It seems a pity that people should be so utterly apathetic on the subject, even where their most vital interests are involved; and it is equally a matter of regret that the inertia of this apathy is well nigh irresistible and insurmountable. Of course, the public is so used to new inventions, marvellous discoveries, wonder-

ful schemes, and innumerable nostrums—each and all capable of setting the Thames on fire, of abating every nuisance, relieving every grievance, removing every disability, of righting every wrong, and indeed, of at once inaugurating a truly Millennium Age, in which everything will be as it ought to be—that they have grown callous to such pretensions and professions, and look with indifferent or with suspicious eye upon any form of suggested reform in science, art, politics, social or domestic economy, and even in the realm of education. This is unfortunate for all concerned, but, nauseated as one may be with a wearisome succession of such pretentious specifics for the woes of mankind, it still behoves us not to recklessly consign to neglect every fresh remedy for one or other of the ills that afflict us, lest in our haste we cast from us as worthless a "pearl of great price"—a veritable good that might advantage the world at large. Wherefore the author is so anxious that every reader shall peruse the whole argument, that he may be qualified to form an adequate and just opinion of the merits of the case.

If our employers of labour would only recognize the gain to their own pockets, they would not hesitate for one moment in demanding two-handed workmen, and in refusing to accept any who were not as dextrous with the one hand as with the other. It will come to this in the long run, and we feel assured that eventually—yes, in the very near future—Ambidextrous labour will assert its supremacy, and all our handicrafts will be truly two-handed, as indeed they ought to have been from the very beginning. The sooner this state of things is brought about the better for all concerned.

LIST OF OCCUPATIONS, TRADES, AND SPORTS WHEREIN AMBIDEXTERITY IS A DISTINCT GAIN OR AN ESSENTIAL FACTOR.

Accordion-player.
Accoucheur.
Accountant.
Acrobat.
Actor.
Actuary.
Aeronaut.
Amber worker.
Analyst.
Anatomist.
Apiarist.
Apothecary.
Archer.
Architect.
Artilleryman.
Artist.
Astronomer.
Athlete.
Auctioneer.
Aurist.
Awl blade maker.
Badminton.
Bag maker.
Bagatelle.
Bagpiper.
Baker.
Bandmaster.
Barber.
Bargee.
Barker.
Barmaid.
Barrow maker.
Baseball.
Basket maker.
Bassoon player.
Bell founder.
Bell hanger.
Bell ringer.
Bellows maker.
Belt maker.
Bentwood maker.
Bicyclist.
Billsticker.
Birdcage maker.
Blacksmith.
Blind maker.
Boiler maker.
Bone setter.
Bookbinder.
Bootmaker.
Bottle blower.
Bottle cleaner.
Bottler.
Bowler.
Boxer.
Box maker.
Brakesman.
Brander.
Brasier.
Brass finisher.
Brassfounder.
Brewer.
Bricklayer.
Brick maker.
Broom maker.
Brush maker.
Bugler.
Builder.
Butcher.
Button maker.
Cabinet maker.
Calenderer.
Candle maker.
Cane worker.
Cannoneer.
Cardboard cutter.
Carder.
Carpenter.
Carpet beater.
Carpet weaver.
Carriage ironer.
Carriage trimmer.
Carrier.
Carter.
Cartridge maker.
Cartwright.
Casemaker.
Cashier.
Caster.
Cellarer.
Chair maker.
Chambermaid.
Charwoman.
Chaser.
Chemist.
Chimney sweep.
China riveter.
Chiropodist.
Cigarette maker.
Cigar maker.
Circus rider.
Clear starcher.
Clerk.
Climber.
Clock maker.
Clog maker.
Cloth weaver.
Cloth worker.
Coach maker.
Coach smith.
Coal trimmer.
Coffin maker.
Coiner.
Comedian.
Compositor.
Confectioner.
Conjurer.
Constable.
Contortionist.
Conveyancer.
Cook.
Cooper.
Coppersmith.
Copyist.
Cork cutter.
Cornet playing.
Correspondent.
Cotton spinner.
Cricket.
Croquet.
Curling.
Currier.
Cutler.
Dairymaid.
Darner.
Deck hand.
Decorator.
Deer stalker.

Dentist.
Designer.
Diamond cutter.
Die sinker.
Digger.
Dispenser.
Distiller.
Diver.
Draper.
Draughtsman.
Dressmaker.
Drill-sergeant.
Driller.
Driver.
Drover.
Drug grinder.
Drummer.
Dustman.
Dyer.
Editor.
Electrician.
Embosser.
Embroiderer.
Engine driver.
Engineer.
Engine smith.
Engine turner.
Engraver.
Engrosser.
Envelope maker.
Equestrian.
Etcher.
Fan maker.
Farmer.
Farrier.
Feather dresser.
Felt maker.
Fencer.
Fiddler.
File cutter.
Fireman.
Fish curer.
Fisherman.
Fitter.
Flautist.
Flax dresser.
Flax spinner.
Florist.
Forester.
Frame maker.
French polisher.
Fret cutter.
Fret worker.
Furrier.
Gardener.
Gasfitter.
Gauge maker.
Gauger.
Geologist.
Gilder.
Glass bender.
Glass beveller.
Glass blower.
Glass cutter.
Glass driller.
Glass grinder.
Glazier.
Glover.
Glue maker.
Goldbeater.
Gold blocker.
Gold cutter.
Gold digger.
Goldsmith.
Golfer.
Gondolier.
Grafter.
Grainer.
Granite cutter.
Grinder.
Grocer.
Groom.
Guide.
Gunner.
Gun polisher.
Gunsmith.
Gymnast.
Haberdasher.
Hairdresser.
Hair worker.
Hair-pin maker.
Hammerer.
Harness maker.
Harpist.
Harrower.
Harvester.
Hatter.
Hedger.
Herdsman.
Hinge maker.
Hop picker.
Horsebreaker.
Horse clipper.
Horseman.
Horseshoe maker.
Housemaid.
Hunter.
Illuminator.
Inlayer.
Ironforger.
Ironfounder.
Ironsmith.
Ironworker.
Ivory turner.
Japanner.
Jet worker.
Jeweller.
Jobber.
Jockey.
Joiner.
Journalist.
Juggler.
Jute spinner.
Kitchenmaid.
Knife grinder.
Labourer.
Lace cleaner.
Lace maker.
Lacquerer.
Lacrosse.
Ladder maker.
Lamplighter.
Land surveyor.
Lapidary.
Lather.
Lath splitter.
Lath worker.
Laundrymaid.
Lawn tennis.
Leather cutter.
Lighterman.
Lime burner.
Linen weaver.
Lithographer.
Lithotomist.
Loader.
Locksmith.
Lumberer.
Lutist.
Machinist.
Maltster.
Mangler.
Mantle maker.
Marbler.
Mariner.
Marksman.
Mason.
Matador.
Match maker.
Mat maker.
Metal polisher.
Metal worker.

Microscopist.
Midwife.
Milkmaid.
Miller.
Mill hand.
Milliner.
Millwright.
Miner.
Minter.
Modeller.
Model maker.
Moulder.
Mountaineer.
Musician.
Nail maker.
Navvy.
Needle maker.
Needlewoman.
Net maker.
Nurse.
Nurseryman.
Oar maker.
Oboist.
Oculist.
Operator.
Ophthalmologist.
Optician.
Organ blower.
Organ builder.
Organ grinder.
Organist.
Packer.
Packman.
Painter.
Paperhanger.
Paper maker.
Paragraphist.
Pastrycook.
Pattern maker.
Pawnbroker.
Pay-clerk.
Pearl worker.
Peddler.
Pen maker.
Penholder maker.
Pewterer.
Photo colourer.
Photographer.
Physician.
Pianist.
Piano-key maker.
Piano-pin maker.
Piano tuner.
Picture cleaner.
Pill-box maker.
Pin maker.
Pipe maker.
Plane maker.
Plasterer.
Plumber.
Polisher.
Portfolio maker.
Potter.
Presser.
Print mounter.
Printer.
Pulley maker.
Pump maker.
Racket maker.
Railway carriage maker.
Railway chair maker.
Railway wagon builder.
Railway wheel maker.
Razor grinder.
Razor strop maker.
Reporter.
Ribbon weaver.
Rivet maker.
Rope maker.
Rug weaver.
Rule maker.
Rush weaver.
Sack maker.
Saddler.
Safe maker.
Sail maker.
Sailor.
Sanitary expert.
Sash maker.
Saw maker.
Saw sharpener.
Scale maker.
Scene painter.
Scissor grinder.
Scissor maker.
Screw maker.
Scull maker.
Sewer.
Shade maker.
Ship joiner.
Ship modeller.
Ship rigger.
Ship smith.
Shipwright.
Shirt dresser.
Shirt maker.
Shoeblack.
Shoemaker.
Shorthand writer.
Shovel maker.
Sign painter.
Silk weaver.
Silver beater.
Silversmith.
Skinner.
Slate cutter.
Slate enameller.
Slater.
Slaughterman.
Smelter.
Spectacle maker.
Splint cutter.
Stainer.
Stamp cutter.
Steel forger.
Steel founder.
Steel maker.
Steel pen maker.
Steel plate maker.
Steel rail maker.
Steel wire maker.
Stencil cutter.
Stoker.
Stonemason.
Stool maker.
Stove mounter.
Straw plaiter.
Surgeon.
Surveyor.
Sword cutler.
Table maker.
Tailor.
Tank builder.
Tanner.
Taxidermist.
Teacher.
Telegraphist.
Telegraph worker.
Telephone worker.
Telescopist.
Tennis.
Thread spinner.
Ticket writer.
Tile layer.
Tiler.
Tinner.
Tin plate worker.
Tinsmith.
Tire smith.
Tool grinder.

Toy maker.
Trunk maker.
Truss maker.
Tube maker.
Turncock.
Turner.
Type founder.
Typewriter.
Umbrella maker.
Upholsterer.
Valve maker.
Veneer cutter.
Veterinary surgeon.
Vice maker.
Violinist.
Watchmaker.
Watch-case maker.
Wax modeller.
Weaver.
Wheelwright.
Whip maker.
Wicker worker.
Wig maker.
Window-blind maker.
Window cleaner.
Wire drawer.
Wire nail maker.
Wire netting maker.
Wire rope maker.
Wire worker.
Wood carver.
Wood engraver.
Wood fencer.
Wood turner.
Wool comber.
Worsted spinner.
Writer.
Yarn weaver.
Zinc drawer.
Zinc nail worker.
Zinc plate maker.
Zinc worker.

CHAPTER V

AMBIDEXTERITY AND LEGISLATION

Is the subject which has been so fully discussed in the preceding pages—the subject of a general and generally taught Ambidexterity—of sufficient importance to the individual, to the several industries of our manufactures and commerce, to the navy and army, and to the community at large, to justify interference by our Legislature?

Are the benefits derivable from, as well as the disabilities and disadvantages prevented by, true two-handedness, numerous enough, valuable enough, and at the same time serious enough, to reasonably call for state aid to enforce it?

Can any one peruse Chapter VI., Part I., where these benefits are duly classified and set forth, or the *résumé* of them that immediately follows these remarks, and deny that there is abundant evidence (if true) to warrant such an interference and to demand such an official authorization? We think not.

There are scores of acts on the statute-book of this great kingdom legislating on matters of the most trivial kind as and when compared with the vast importance and boundless extent of AMBIDEXTRAL EDUCATION. Indeed we are strongly of opinion that there are few subjects dealt with by our two houses of Parliament, year by year, having greater or even equal claims to the attention of the country, and the legislative action of those august assemblies.

At the risk of being tedious, let us briefly recapitulate

the solid benefits that would be secured by the adoption of a universal and perfect Ambidexterity; an Ambidexterity that would render both hands as naturally and mutually expert in every conceivable occupation as Paderewski's hands are on the piano, or as the hands of every person are in the simple and instinctive acts of opening, closing, or holding.

1. There would be an almost complete immunity from the disease of Aphasia, and from the various hand cramps, or palsies, that afflict so many thousands.

2. There would be a gratifying diminution in pulmonary and chest diseases.

3. The brain speech area would be doubled, and both lobes would be symmetrically organized, thus involving increased force and intellectuality.

4. The physique and the entire being of the individual would be greatly quickened and improved.

5. The right hand would attain a higher proficiency and dexterity than it has ever reached, or could ever reach, by separate cultivation.

6. All handicrafts (from 600 to 1,000) would be stimulated and benefited.

7. All games and recreations would reap a material advantage.

8. School work would be rendered easier for both teacher and scholar; and the school course would be made shorter.

9. Simultaneous two-handed labour would be made possible, much more effective than it is at present, and profitable, in certain specified and limited conditions.

10. The efficiency of the army and navy would be greatly increased.

Now of these ten compound blessings the first four are vouched for by medical authorities, against whose pronouncements there cannot possibly be any appeal—at any rate by laymen who are wholly incompetent to criticize or controvert them.

The 5th and 8th are attested by Professor Tadd, who speaks from an experience of twelve to fourteen years, and from observation of the effects of Ambidextral instruction (in a limited degree, be it noted) on thousands of pupils, and also by scores of primary and secondary teachers in this country.

The 6th and 7th are so obvious to every one, that any challenge or denial is out of the question.

The 9th is an integral part of the system, quite inseparable therefrom. And

The 10th has the assent of naval and military officers and the support of every intelligent person.

THEREFORE we may accept as satisfactorily established every and all these claims to superiority that are put forward on behalf of the innovation we advocate; and in the face of it all, we again ask, with the fullest confidence in our case, is it not strong enough to warrant the Legislature taking prompt and active steps to make bimanual training thorough, universal, and compulsory in every elementary school and in every secondary institution throughout the length and breadth of this great Empire?

It is by no means a small consolation to know that the outworks of professional opposition have already been carried and are in our possession; for in addition to the medical opinions previously quoted, we have equally favourable expressions from some of the foremost educationalists of the time. A typical selection is appended.

In addition to these, Professor Dr. Cummings, Miss F. Gadesden, A. T. Pollard, Esq., M.A., W. G. Rushbrooke, Esq., M.L., James Welton, Esq., M.A.—all widely known authorities—are cordially disposed towards and approve the New Education. Last, but by no means least, Baden-Powell is a celebrated Ambidexter, and has been so from his youth up; along with whom there are many other notables in art, science and literature, who practise the accomplishment in their private life.

We feel sure that it only requires the British people and the British Parliament to be made acquainted with the facts as they stand, and Ambidextral Education will become a constitutional enactment, and a constitutional entity, without difficulty or delay.

That this consummation may be speedily realized is the earnest hope of the author.

APPENDIX

It will interest the reader to learn that a Society has recently been formed for the promotion of this Educational Reform and Two-handed Training, and that its principles and efforts have met with a most cordial reception from all classes of the community and from all sections of the Press. In order that the representative character of its membership may be seen, the names of its Executive are here subjoined, whilst appended thereto is a selection of typical opinions from those who are in sympathy with its object.

If the writer of the preceding pages can only live to see the inclusion of Ambidextral Culture as a living and dominant factor in the national life, and thus witness the realization of this his supreme desire and ambition for the welfare and improvement of his fellows, he will gladly sing his *Nunc Dimittis* and retire from the arena of active service with a contented mind.

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It is with much pleasure that I produce more at length the views of Dr. C. E. Brown-Sequard, whose name is familiar in connection with Brain Literature. In a powerful paper ("Forum," August, 1890) the object of which is to substantiate Dr. Wigan's Original Theory, he has the following paragraphs :—

"Each half of the brain is capable of originating all the voluntary movements of both sides of the body, and possesses the powers of perception of the various sensitive im-

pressions that may proceed from the whole body; so that, in the same manner that we have two eyes, two ears, etc., we also have two great nerve centres, each of which is capable of performing in its full extent every physical cerebral function. . . . In a Paper I read at the Meeting of the British Medical Association at Cambridge, England, 1880, I gave a number of conclusions drawn from more than 500 cases of unilateral convulsions due to brain disease, showing how various these cases were as regards the seat of the lesion which caused these manifestations, the muscles attacked and the connection of this symptom with paralysis and other phenomena. Among other things I showed, (1) that convulsions can appear on the hemiplegic side or on the other, whatever be the seat of the lesion; (2) that if unilateral convulsions from disease of the side of the surface of the brain appear far more frequently on the opposite side of the body, they occur, on the contrary, more often on the corresponding side of the body when they are caused by disease of the base of the brain. It is clear from these general data and from many others that convulsions cannot be considered as supporting the view that each cerebral hemisphere contains the only centres and conductors for the voluntary movements in the opposite side of the body. The most decisive argument against the view that we have but one brain for voluntary movements, comes from cases of destruction, in men as well as animals, of some part of the supposed motor centres or conductors or of almost the whole, and even the whole of a hemisphere without paralysis. . . . As regards men, facts abound showing that destruction of every individual part of the hemisphere can take place without the disappearance of the voluntary motor functions. Leaving aside cases of tumours and abscesses, there are on record to my knowledge, more than fifty well-authenticated cases of considerable lesion or complete destruction of the so-called psycho-motor centres on one side, without paralysis. . . .

"Arguments similar to those concerning the voluntary

movement exist also as regards the transmission and the perception of sensitive impressions. They give forcible proofs that one cerebral hemisphere may be quite sufficient for the perception of all the impressions coming from the various parts of the two sides of the body.

"One of the strongest arguments against the received views and in support of the idea that one side of the encephalon is quite sufficient for the transmission and perception of the sensitive impressions coming from the two halves of the body, is that sensibility can persist entire, notwithstanding the destruction of ANY PART of one half of the Brain."

He concludes as follows :—

"That we have more brain matter than is needed, is clearly proved by the facts and reasonings contained in this paper. This is also shown by a great many cases in which considerable destruction of cerebral tissue, on the two sides, has occurred without any loss to either the physical or the mental functions of the brain. Not only can half of the encephalon carry on all the functions known to belong to the whole brain, but there are cases of almost complete destruction of one side and also of a part of the other side of the brain, without either an alteration of the mental powers or the loss of the physical faculties of the great nerve centre."

"In connection with the subject of the duality of the brain, there is one point of great importance about which I can only say a few words. It is that we have a great many motor elements in our brain and our spinal cord which we neglect absolutely to educate. SUCH IS THE CASE PARTICULARLY WITH THE ELEMENTS WHICH SERVE FOR THE MOVEMENTS OF THE LEFT HAND. PERHAPS FATHERS AND MOTHERS WILL BE MORE READY TO DEVELOP THE NATURAL POWERS OF THE LEFT HAND OF A CHILD, GIVING IT THEREBY TWO POWERFUL HANDS, IF THEY BELIEVE, AS I DO, THAT THE CONDITIONS OF THE BRAIN AND SPINAL CORD WOULD IMPROVE IF ALL THEIR MOTOR AND SENSITIVE ELEMENTS WERE FULLY EXERCISED."

TYPICAL OPINIONS

"WISHING you all success in your crusade on behalf of the neglected left hand."—The **Rev. H. J. Dukinfield Astley,** M.A., F.R.Hist.S., &c.

"The utility of teaching Ambidexterity goes without saying."—**Lord Charles Beresford.**

"I certainly think it would be advantageous for children to use both hands alike."—**Miss A. Blagrave,** B.A., City of London School for Girls.

"I am very much in favour of encouraging the use of the left hand for independent action."—**Surgeon-General A. Frederick Bradshaw,** C.B., &c., Hon. Physician to the King, Oxford.

"All those conditions which your Society proposes are recognized by every genuine association for the promotion of true education."—**Mrs. S. Bryant,** D.Sc., North London Collegiate School for Girls.

"Much more could be made of the left side by careful education, and in this I am in full sympathy with the efforts of your Society."—**D. J. Cunningham,** M.D., D.Sc., D.C.L., LL.D., F.R.S.

"To be equally expert with either hand is more than a convenience and useful accomplishment, it is a valuable commercial asset, and an insurance against accidents."—**Captain W. Edgeworth-Johnstone,** Royal Irish Regiment.

"I believe in Ambidexterity firmly, for physiological, psychological, economic, and educational purposes."—**Miss E. P. Hughes,** late Camb. Day Training College.

"Has always thought that it would be a good thing if children could be taught to use both hands much more freely than they do now."—**The Countess of Jersey.**

"I quite approve of the principles of your movement."—**Rev. the Hon. Canon Lyttelton,** M.A., Haileybury.

"I think the idea an admirable one, and it has my hearty sympathy."—**Sir W. Blake Richmond,** K.C.B., M.A., R.A., F.S.A., D.C.L., J.P.

"I cordially approve of the system."—**Professor Ebenezer Prout,** Mus. Doc.

"I sympathize with your desire to promote Ambidextral Culture." —**Sir W. H. White,** K.C.B., F.R.S., LLD., D.Sc.

"I heartily approve of all your theories and movements in regard to writing."—**Richard Wormell,** Esq., D.Sc., M.A.

"It is not difficult to imagine circumstances under which the possession of symmetrically developed powers of brain and body might be of the greatest possible value. "We feel sure that the general adoption of ambidextrous training would be of unmixed benefit to the community."—"**The Hospital.**"

"Granting that the teaching of Ambidexterity is necessary to counteract, or, rather, to prevent, the assumption of bad postures, it follows, as a matter of course, that such teaching should immediately be made compulsory in all schools; and, even if not absolutely necessary, still there is little doubt but that such training as that advocated by the Ambidextral Culture Society would be productive of much real good, both physical and mental."—"**Teachers' Times.**"

"That the two hands of the child should receive equal training need not be repeated to teachers. . . . The great convenience of being able to use the left hand with equal readiness will strike us all, and the only wonder is we have never seriously considered the question before."—"**Schoolmaster.**"

INDEX

ADAMS, Mr. W., on the evils of Sloping Writing, 215
Adcock, Sir H., on Ambidexterity of Persians, 114
Advantages of Ambidexterity, 120, 244
of Vertical Writing, 222
Advisability of Legislation, 243
African Tribes, Ambidexterity of, 54
Agraphia, 124
Aimé Péré and Hereditary Left-handedness, 55
Transposed Viscera, 71
Alcock, Sir Rutherford, on Japanese Art and Handicrafts, 145
"All the Year Round," A writer in, 151
Alternations of Volitions, 172
Ambidexterity, and Customs of Society, 160
in the Services, 137
Possibility of, 108
Ambidextral Culture, 98, 195
its Objects, 139
in School, 199
in the Nursery, 197
Society, 120, 247
Drawing, 226
Handwriting, 138, 206
Instruction, its outcome, 225
Anatomy, Journal of, *re* Monkeys, 27
Animal One-sidedness, 25 *et seq.*
Animals and Birds at the Zoo, 25, 28
right-lying, 29, 31
Aorta Arches, Arrangement of, 72
Reversal of, 78
Aphasia, 122
Approving Authorities in Education, 247 *et seq.*
Aristotle, on "Organic Structure," &c., 1, 63
Arm Lengths in the Human Body, 23
Arrangement of Blood Vessels, Dr. Barclay on, 73
Aspertino, Amico, an Ambidexter, 115
Astley, The Rev. H. J. D., M.A., Litt.D., on Ambidexterity and Primitive Man, 12
Asymmetry and One-sidedness, 20
in Fish, 25
Automaticism in Writing and Drawing, 231
"Awkward Hand," The, 95

BADEN-POWELL, Major-Gen., R.S.S., an Ambidexter, 114, 245
on the advantages of Ambidexterity, 137
Baer, Dr. von, his theory, 68
Baldwin, Dr. J. M., Experiments by, 80 *et seq.*
on Infantile Right-handedness, 44
Ball, Prof., on Right-handed Pre-eminence, 5
Barclay, Dr., His Theory, 73
on Arrangement of Blood Vessels, 73
on Brain One-sidedness, 78
Barwell, Mr. R., on Sloping Writing, 215
Bastian, H. Charlton, M.D., on Brain Lobes, 95
on Ambidexterity, 135
Bell, Sir Charles, on Brain One-sidedness, 79
on "The Hand," 5
opinions of, 231
on Right-handedness, 64
Benjamites, The, Left-handed slingers in the army of, 1
Beyr, Dr., on Speed in Vertical Writing, 220
Bible and Right-handedness, 15
First mention of Right and Left Hands, 13
Quotations *re* "The Right Hand," 14
Bimanual Education, 195, 225
Birds and animals in the Zoo, 25, 28
Blackboard Free-arm Work, 203, 231
Blood Vessels, Arrangement of, 73

Boer War and Two-handedness, 105
"Book of Kells," 15
Borham, Mr., on "Sporadic Right-handedness," 45, 47
Boyd, Dr., on Brain One-sidedness, 75
Bradshaw, Surgeon-General, on Advantages of Ambidexterity, 135
on left-handedness, 10
Brain Convolutions, 75, 94
One-sidedness, 73
Structure, 93
Brain-Weight, 76, 94
Braune on Brain-Weight, 76, 94
Brazilian Ladies mounting on the left side, 9
Broadbent, Dr., on Brain Convolutions, 75
Broadhurst, Mr. B. E., on Sloping Writing, 216
Brodie, Sir B., on Original Instinct, 63
Brown, Sir Thomas, on Dextral Pre-eminence, 47
Brown-Sequard, Dr. C. E., on Ambidexterity, 248
Buchanan, Dr., his Mechanical Theory, 58, 59, 60
His Theory of Left-handedness, 60
advises Two-handed development, 102
enunciates Dr. Barclay's Theory, 73

CAHALL, Dr., on Brain One-sidedness, 74
on Hand Development, 103
Calligraphic advantages of Ambidexterity, 135
Campbell, Dr. F. J., on Ambidextral Culture, 135
Cangiagio an Ambidexter, 115
Carter, Dr. E. C., and Transposed Viscera, 71
Carter, Mr. R. B., on Right-handedness, 46
Cases of Transverse Visceral Distribution, 39
Cave-men's Drawings, 13
Cheadle, Dr., and Transposed Viscera, 71
Cinquevalli, Paul, on Ambidextral Culture, 192
his Powers of Multiplex Action, 192
Civilization and Right-handedness, 17
Clarke, Mr. J. J., on Posture in Sloping Writing, 214
Cleverest Pupils and Right-handedness, 17
Coaita and prehensile movements, 67
Cohn, Dr. H., on Vertical Writing, 216
Collateral Advantages of Ambidexterity, 137
Colvin, Sidney, in "Enc. Brit.," 115
Competitions in Two-handed Writing, 118
Concurrent Movements in Weaving, 175
and Processes in Organ-playing, 176
in Hand-loom Weaving, 185
letter writing, 193
Congress of Hygiene and Demography, on Vertical Writing, 218
Connection between Brain and Hand, 88
"Cornhill," Writer in, on Right-handedness, 49, 54
Culture, Ambidextral, 98, 195
Cunningham, Dr., on One-handedness, 55
on Development of Right Arm, 59
on Transposed Viscera, 71
on One-sidedness in Apes, 72
on Brain One-sidedness, 76
on Brain-Weight, 77
his Argument, 85
Curriers, Testimony of, 38

DALLINGER, Dr., Ambidextrous, 135
Darwin and Natural Selection, 90
Dextral Pre-eminence, 13, 41
Dextrocerebral Atrophy, 106
Difference of Asymmetry and One-sidedness, 39
Disadvantages of One-handedness, 99
Donaldson, Dr., "The Growth of the Brain," 76, 83
Drawing, Ambidextral, 117, 226
Drawings by Cave-men, 13
Drill forms, 231
Dwight, Dr. T., on Asymmetry and One-sidedness, 21, 24
on Impulse and Instinct, 64
on Arm Lengths, 24
on "Primitive Warfare" Theory, 51
and the Hypothetical Donkey, 64

ECONOMICAL Advantages of Ambidexterity, 136
Economy in Writing, 221
Edgeworth-Johnston, Captain, on Two-handedness, 91
"Edinburgh Medical Journal," Sir John Struthers in, 30

Education and Right-handedness, 49
Bimanual, 195
Eolithic Man and Ambidexterity, 12
Equality of Left Hand, 48
Erlenmeyer, Dr., on Hebrew Ambidexterity, 207
Eulenberg, Dr., on Sloping Writing, 215
Evidence of Tanners and Curriers, 38
Eyes, Writing in relation to, 216

FERRIER, Dr., "The Functions of the Brain," 82
Finger-tip Marks, Comparison of, 21
First mention of Right and Left Hands in Bible, 13
Fish, Asymmetry in, 25
Forster and Visceral Distribution, 68
Franchesci, Dr., weight of brain, 77
F.R.C.S., on Hereditary Left-handedness, 56
Freak of Nature, A, 97
Free-arm Blackboard Work, 203, 231
Functional Impotencies, 101
Unity, 186

GACHET, Dr., and Transposed Viscera, 70
Garson, Mr. J. G., on Bone Lengths in Human Body, 23
General Class Work in Ambidexterity, 203
Gery, Dr., and Transposed Viscera, 70
Glacial Period and Eolithic Race, 12
Gouber, Dr., on Vertical Writing, 215
Gould, Dr., on Objections to Ambidexterity, 165
Impossibility of Ambidexterity, 108
his Argument against possibility of Ambidexterity, 109
Gowers, Sir W. R., on Advantages of Ambidexterity, 135
Aphasia, 120
Brain One-sidedness, 79
Possibility of Two-handedness, 123
Ambidextral Writing, 117
and Transposed Viscera, 71
Writer's Cramp, 124
Grooved Tablets for Writing, 224
Gross, Dr., on Sloping Writing, 215

HADDEN, Dr., on Hereditary Left-handedness, 56
Remarkable Case by, 71
Hand Culture and the Feeble-minded, 129
Memory, 132
Hand Development, 6
Handicrafts and Two-handedness, 235
Handwriting and Ambidexterity, 117, 137
Ambidextral, 206
Harrison, Mr., on "Plateau Implements," 12
Hebrew Ambidexterity, 207
Hereditary Transmission of Left-handedness, 55
Heron, Dr., and Transposed Viscera, 71
Hides, Difference in thickness in the sides of, 35-38
History, Argument from, 143, 145
Highest Developments and Right-handedness, 161
Hitchcock, Dr., on Arm Lengths, 24
Strengths, 24
Hodgson, Mr., H.M.I., on Vertical Writing, 219
Holbein, Hans, an Ambidexter, 115
Hollis, Dr., on Advantages of Ambidexterity, 126, 140
Animal One-sidedness, 71
Hand Culture, 103
Lop-sided Generations, 27
Writer's Cramp, 103
Home Training of the Two Hands, 197
Honours in Left-hand Drawing, 117
Human Body, Arm Lengths in, 23
Humphrey, Dr., on Animal One-sidedness, 27
The Human Foot and Hand, 48
Hygiene and Demography, Ninth Congress of, 218
Hyrtl, Dr., on Arrangement of Blood-vessels, 72

IGHTHAM, Plateau and ancient implements, 12
Imbecility and Two-handed Culture, 131
Importance of Writing, 207
Impotencies, Functional, 101
Infantile Right-handedness, Dr. Baldwin on, 44
Infant School, Training in Ambidexterity, 200
Instinct and Right-handedness, 64
Instruction, Ambidextral, 195 *et seq.*

JAPANESE Handicrafts and Ambidexterity, 145
Johnson, Dr., Definition of Ambidexterity, 120

Journal of the Anthropological Institute, 56
Journal of the British Archæological Association, 12
Justifiable Legislation, 243
Justin, on Scythian Valour, 143

"KELLS, Book of," 15

"LANCET," on Ambidexterity and Writer's Cramp, 124
Landseer, Sir E., an Ambidexter, 114
his facility in Painting, 173
his Simultaneous Ambidextral Draughtmanship, 174
Lees, Dr., and Transposed Viscera, 70
Left Hand, present condition of, 7
suppression of, 7, 197
use of, at the present day, 10
Left-hand Drawing, Honours in, 117
Left-handedness, Explanation of, by Dr. Buchanan, 60
in primitive man, 11
is Hereditary, Dr. Lundie, 55
Legibility, Writing in relation to, 218
Legislation, Advisability of, 243
Leonardo da Vinci an Ambidexter, 115
Lewis, Dr. Percy S., 216
Liebrich, Mr. R., on Sloping Writing, 214
List of Trades and Occupations, 239
Lithgow, Dr., on advantages of Ambidexterity, 140
On Hereditary Left-handedness, 55
London Exhibition of Japanese Art, 145
"Lop-sided Generations," by Dr. Hollis, 27
Lorenz, Professor Dr., on Vertical Writing, 215
Lundie, Dr., on Advantages of Ambidexterity, 140
Hereditary Instinct, 55
The Sinistral Hand, 100

MAN not symmetrically formed, 20
Maudsley, Mr., on Brain Development and action, 230
Mechanical Advantages of Ambidexterity, 122
Mechanical "Theory" of Right-handedness, 58
Medical Advantages of Ambidexterity, 134
Meissonier on Drawing, 230
Memory Drawing, 233
Mexican Picture Writings, 11
Miscellaneous Advantages of Ambidexterity, 137
Monkeys, Right-handedness of, 25
Moral Advantages of Two-handed Training, 129
Morse, Professor E., on Advantages of Ambidexterity, 135
Morse, Professor H. N., an Ambidexter, 113
Mozzo, of Antwerp, an Ambidexter, 115

"NATURAL Endowment," A, 63
"Natural Selection," Theory of Right-handedness, 84
Nelson, Lord, his Left-hand Writing, 119
Neolithic Man and Ambidexterity, 12
Nursing a Cause of Right-handedness, 44

OBJECT of this Manual, 3
Objections to Ambidexterity, 150
Objections to Simultaneous Work, 180
Objects of Ambidextral Culture, 139 *et seq.*
Occupations, List of, 239
Ogle, Dr., on Brain One-sidedness, 73
Hereditary Left-handedness, 56, 57
Left-hand Writing, 104
Right-handedness or -sidedness of Monkeys and Parrots, 25
One-handedness, a "Freak of Nature," 97, 98
One-handedness, Inquiry into, 43
Theories of, 43
One-handedness, Universality of, 9, 41, 42
One-handed Training in Schools, 196
One-sidedness and Asymmetry, 20
Organic Structure, Aristotle on, 63
Original Instinct and Right-handedness, 63
Outcome of Ambidextral Teaching, 149
Ox-hides, Thickness of, 37

PAGET, Sir James, and Piano-playing, 188
Paleolithic Man and Ambidexterity, 12
Palmerston, Lord, on Writing, 207
Parrots, One-sidedness of, 25
Physiological Advantages of Ambidexterity, 122
Picture Writing by Mexicans, 11
Plate River, Hides from, 38

Plato, his opinion of Right-handedness, 44, 141
Pliny, on the Scythians, 144
Poore, Dr. G. V., on the act of Writing, 208
on Functional Impotencies, 101
on Writer's Cramp, 125
"Popular Science Monthly," Dr. Cahall in, 74
Dr. Gould in, 108 *et seq.*, 165 *et seq.*
Position of Heart, 50, 51.
Positive Physiological Advantages, 127
Possibility of Simultaneous Work, 172
Posture in Sloping Writing, 216
Pre-eminence of Right Hand, 5 *et seq.*
Preventive Physiological Advantages, 122
Primitive Warfare and Right-handedness, 49
Proportion of Right-handed Persons, 9
right-handed and left-handed persons, 9
two-handed persons, 9
Proposed solution of right- and left-handedness, 97;
Psychological effects of Ambidexterity, 201
Pye-Smith, Dr., on Primitive Warfare, 49
and Transposed Viscera, 70, 71

QUICK, Mr., on Plateau Implements, 12
Quotations, Biblical, on the right hand, 14

READE, Ch., on Advantages of Ambidexterity, 140
Reed, T. A., on Speed in Writing, 220
Reports from Headmasters *re* Right-handedness, 17
Responsiveness of Left Hand, 10, 19, 48, 53, 92, 109, 111, 113 *et seq.*, 128, 148, 160 *et seq.*, 167 *et seq.*, 174 *et seq.*, 224, 234
Résumé of Advantages of Ambidexterity, 244
Reuss, Dr. A. von, on Vertical Writing, 217
Reversal of Aorta Arches, 78
Richardson, Dr. W. B., on Sloping Writing, 217
Right Hand, Pre-eminence of, 5 *et seq.*
Right-handedness, What is it? 41
and the Bible, 13
the result of Nursing, &c., 44
Right-handedness the result of practice in writing and drawing, 46
"an acquired habit," 47
a Mechanical Result, 58
Result of Organic Structure, 62
an Hereditary Instinct (Impulse), 55
from Primitive Warfare, &c., 49
a Natural Endowment, 63
from Visceral Distribution, 68
from Blood-vessel arrangement, 72
from Brain One-sidedness, 73
Right-handedness and Left-handedness, 84
Natural Selection, 84
What it really is, 97
Right lying of Animals, 29, 31
Cases of, 34, 35
Rollet, Dr., on Arm Lengths, 24
Roth, Dr. M., on Sloping Writing, 216
Roth, Mr. B., on Sloping Writing, 214

SAWYER, Sir James, on Advantages of Ambidexterity, 139
Ambidexterity, 50
Position of heart, 50
Visceral Distribution, 68
Sinistral Writing, 118
Schenk, Dr., on Sloping Writing, 215
School Inspector on Ambidextrous Culture, 150
School-training in Ambidexterity, 199 *et seq.*
Schultze, Dr., and Transposed Viscera, 70
Scythians an Ambidextrous Nation, 143
Seguin, Dr., on Hand Culture, 129, 130
Seidl, Miss, on Writing Speeds, 220
Shah of Persia an Ambidexter, 115
Shaw, Dr. James., on Advantages of Ambidexterity, 126
on Right-handedness from Teaching, 49
Visceral Distribution, 71
Writer's Cramp, 126
Shaw, Mr. J., objects to Ambidexterity, 152
on Brain One-sidedness, 74
on Visceral Inequality, 69
Ship Porters and Left-handedness, 62
Side, Disease of, in man, 86, 101, 107
Simpson, Mr. W. J., on Leg Lengths, 24
Simultaneous Movement, 170
Simultaneous Two-handed Writing, 177
Work, 142

Simultaneous Work and Brain Injury, 184
and Concentration, 182
and Mediocrity, 180
on the Violin, 176
Sinistral Hand, The, 111
Sinistrality equal to Dextrality, 111
Skeleton, Human, Lengths of Bones, 23 *et seq.*
Slingers, The 700 Benjamite, 1
Sloping Writing, Injurious effects of, 213-216
Smith, Mr. Noble, on Ambidexterity, 127
on Sloping Writing, 213
Snell, Mr. S., on Ambidexterity, 135
an Ambidexter, 114
on Vertical Writing. 216
Specimens of Two-handed Concurrent Work, 179
Speech Centres in Brain, 79, 122, 123
Speed in Vertical Writing, 219
Spencer, Herbert, and Evolution, 91
Spine, Writing in relation to, 213 *et seq.*
Sporadic Right-handedness, 57
Stanley, Sir H. M., on African Tribes, 54
Stephens, Mr. Fred. G., on Landseer's Concurrent Drawing, 173
Struthers, Sir J., on Hide Thicknesses, 30
Right-handedness, 63
Visceral Distribution, 69
Supports Mr. Shaw, 72

TABLETS, Grooved, 224
Tadd, Professor, on Automaticism, 231
His Art School, 128
His Testimony *re* Ambidexterity, 128
on Ambidextral Training, 157
on Ambidextral Drawing, 227
Tanners, Evidence of, 36, 37, 38
Taylor, Dr. Seymour, and Transposed Viscera, 70
Theories of Right-handedness, 41
Thurnam, Dr., on brain-weight, 76
Tooke, Horne, and his definition, 104
Trades, List of, 239
Transposition of Viscera, 39
Tubby, Mr. A. H., on Sloping Writing, 216
Two-handed Writing, 206 *et seq.*
Two-handedness and the Boer War, 105
in Trades, 235
Two-handedness, The True Theory of, 97
Two Hundred Volitions per Second, 177
Two-sidedness in Animals, 159
Typical Opinions, 251

ULTIMATUM *re* One-handedness, 97
Universal Two-handedness, 237
Universality of Right-handedness, 5

VERTICAL Writing, Dr. G. V. Poore on, 125
Advantages of, 222
and Two-handedness, 212
Viscera, Transposition of, 39
Weights of, 69
Visceral Distribution in Man, 68
in Animals, 71

WAGNER, Dr., on Brain One-sidedness, 75
Wharton, Mr., on Ambidexterity, 104
Wigan, Dr., on Cerebral Destruction, 187
on Feeble Intellect and Hand Development, 130
Wilson, Sir Daniel, an Ambidexter, 113
on Anatomical Development, 148, 152
on Left-handed Children, 53
on Right-handedness, 50
on Two-handed Culture, 119
on Bloodvessel Arrangement, 73
on the Hand, 5
replies to Professor Buchanan, 61
on Hereditary Left-handedness, 56
on Organic Structure and Right-handedness, 63
Women, Ambidextral Superiority of, 191
Students at the Universities, 191
Women and Right-handedness, 53
Writer's Cramp, 101
Writing, Left-hand Competitions in, 118
Writing and Drawing and Right-handedness. 46
Writing in relation to Economy, 221
General Health, 217
Legibility, 218
Speed. 219
Teaching and Learning, 220
the Eyes, 216
the Spine, 213
Wyeth, Dr., on Advantages of Ambidexterity, 139
Anatomical Development, 63

ZOOLOGICAL Gardens, Animals and Birds in, 25, 28, 29

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